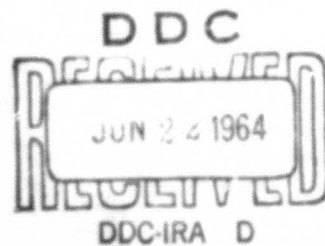


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RADIOLOCATION RESEARCH LABORATORY

TECHNICAL NOTE

Publication No. RRL 230

**A PROGRAM FOR PLOTTING THE RADIOLOCATION
PREDICTIONS AND ANALYZING THEIR ERRORS**

by

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The author wishes to thank Mr. Vincent Mrstik for preparing the paper tapes which are used to plot the coordinate axes for the graphs prepared by this program.

ABSTRACT

This program analyzes the errors of radiolocation predictions and evaluates the average range errors, the root mean square range error, and ten, twenty, and thirty minute cumulative averages of the range errors for both the following:

- a) Range errors of the predicted range with respect to the true range of the transmitter where range is measured from the receiver.
- b) Range errors of the predicted transmitter position where range is measured from the known transmitter location.

In addition to this, the computer punches up paper tapes for operating an X-Y plotter. Two types of graphs are obtained in this manner. One is a plot of predicted range error vs. time where range is measured from the receiver. The other is a plot of the range and bearing of the predicted transmitter position with respect to the known transmitter location. The latter graph is referred to as a target plot. This program is coded in SPAR. The computer involved in this case is a Control Data Corporation G-20A using the SPACE programming system.

1. PROBLEM STATEMENT

Measurements of the vertical angle of incidence and azimuth of an arriving HF radio signal are made with an interferometer. The vertical angle of incidence and vertical incidence ionogram data are used to predict the range or range error in the case where the location of the transmitter is actually known. The azimuth, time, and interferometer predictions from the ionogram studies and other information such as the propagation mode, provide the input to this program. The program analyzes the errors of radiolocation predictions and evaluates the range errors, the root mean square range error, and ten, twenty, and thirty minute cumulative averages of the range errors for both the following:

- a) Range errors of the predicted range with respect to the true range of the transmitter where range is measured from the receiver.
- b) Range errors of the predicted transmitter position where range is measured from the known transmitter location.

In addition to this, the computer punches up paper tapes for operating an X-Y plotter. Two types of graphs are possible. The first is a plot of the range errors mentioned in (a) above as a function of time (see Figure 3). The second is a plot of the range and bearing of the predicted transmitter position from the true transmitter location (see Figure 6). This is referred to as a target plot. In addition calculations are made to obtain the range errors described in (a) and (b) above which are then averaged according to the following scheme:

- a) Ten minute cumulative averages of the range error starting on every ten minutes beginning with the period during which data was first taken.
- b) Same as a) except for twenty minutes.
- c) Same as a) except for thirty minutes.
- d) Average range error.
- e) Root-mean-square range error.

As far as the 10-, 20-, and 30-minute cumulative averages are concerned, an hour is divided into fixed time intervals: i. e., 6-10 minute intervals, 3-20

minute intervals, and 2-30 minute intervals. These intervals are built into the program and are not available to the operator. For example, consider that the first data was recorded at hour $X + 45$ minutes. The printout starts with hour X . The 10 minute cumulative average starts with $X + 40$ as does the 20 minute cumulative average. The 30 minute cumulative average starts with $X + 30$. As was previously implied, the cumulative averages and final averages are printed by a line printer. Since the graphs are plotted on blank paper, the proper coordinates must be plotted on the paper also. This is done by separate paper tapes whose use is described later under Operating Instructions. Because the coordinates are plotted according to a certain scale, it is necessary that the data also conform to this scale which is as follows:

- a) Range Error vs. Time Plots: 50 kilometers and one hour are equivalent to 6666 and 8000 plotter units respectively.
- b) Target Plots: 100 kilometers are equivalent to 8888 plotter input units.

The target plot has its origin at the center of the graph paper, therefore, the plotter is zeroed at this point (see Figures 4 and 5). It is not necessary to change the calibration or zero point of the X-Y plotter for the Range Error vs. time plot as the horizontal centerline of the graph represents 0 kilometer range error and the vertical centerline represents the beginning of the second hour as the time axis of the Range Error plot covers two hours. The calibration for the X-Y plotter is discussed in the operating instructions for this program. A total day's data may easily run more than two hours in which case the data is plotted on succeeding sheets of graph paper. There is, however, no overlapping of the graphs. Note that the odd hours have negative X components but this is resolved by the program. Also in this general problem statement, it is worthwhile to point out some of the contingencies of the data which have been designed into the program. These are as follows:

- a. Target Plot: Sometimes the point to be plotted exceeds some maximum range (greater than ± 75 kilometers north and south and greater than ± 100 kilometers east and west) with respect to the true transmitter position. In this case, this particular point's range and bearing plus some related information is printed out and not plotted. This point, however, is included in the cumulative averages.

- b. **Range Error vs. Time Plot:** Sometimes the range error exceeds ± 50 kilometers in which case the error and time are printed along with some related information and is not plotted. However, it is included in the cumulative averages.
- c. **Raw Data:** Sometimes there are no range predictions available when this data is required. In this event, the data card is read but ignored on input. The reason that data cards of this nature are in the data decks is that part of the input data will be punched up and used by programs, other than this one, which are still in the developmental stages.
- d. An identification, which labels the data following it, is punched in the paper tapes prepared by the computer. The tapes are punched with each class following sequentially and in the following format. For each class: eighteen inches of leader, the data class identification, six inches of blank tape, and then the data block itself followed by a stop code for the plotter.
- e. If no data exists for a particular class or graph (i. e. , Range error data available for 1st and 2nd hours, none for third and fourth, but finally some for the fifth hour) appropriate messages are punched on paper tape.
- f. **Printout, Cumulative Averages:** The value of the average, the number of datum used in computing the average, and the time of the last datum used in computing that average are printed for the ten, twenty, and thirty minute averages in a suitable format.

2. COMPUTATIONAL METHODS

With the exception of the cumulative averages no equations are discussed in this section. The bulk of the arithmetic is performed by the RANGE and COORD subroutines described by RRL Publication No. 231. The remaining mathematics consist of simple trigonometric functions which are readily apparent from the flowchart and listing of this program. Therefore, most of the program involves manipulation of the data according to certain techniques which are outlined and described in this section. Basically the raw data is read in and stored on magnetic tape which is then scanned seven times for each type of plot. The data is scanned once for computing the cumulative average and then once for each of the six data classes which are determined by the antenna pair and propagation mode associated with each sub-group of raw data.

The program is divided up into five sections whose functions are described as follows:

A. Section I

1. Reads two cards of initial data whose contents are described later under Input and Output.
2. Converts the longitude and latitude of the receiver and transmitter from degrees, minutes, and seconds into degrees and fractional degrees which is then converted into radians.
3. Computes the true range between the receiver and the transmitter which is stored for future reference using the RANGE subroutine.
4. Determines the parity (even or odd hours) of the reference time of the initial data. This reference time becomes the basis of a relative time reference hour. The time in hours and fractional hours which appears in the various program printouts in time relative to the initial time reference, i. e., time reference of 2100 hours and a relative time of 1.75 hours imply that the true time is 21:45:00; a time reference of 2200 hours and a relative time of 3.75 hours imply that the true time is 23:45:00
5. Reads in the raw data, packs this in a 256 word temporary holding zone, which when full is dumped onto magnetic tape. When the last of the raw data is read, an "end" code is placed behind the final data all of which is stored on magnetic tape. As the data is read in, the following tests and conversions are made:
 - a. If the predicted range is to be used and is zero, this data card is thrown out.
 - b. Time is converted to fractional hours and added to the either odd or even time reference and stored thus. At each hour change, the time reference is incremented accordingly.
 - c. If time skips an hour, this fact is processed and the time reference is incremented accordingly.

B. Section II

1. Prints the program heading and the proper heading for the cumulative averages currently being computed.
2. Checks to see which plot type is currently being analyzed and on the basis of this proceeds to either (a) or (b) as follows:
 - a. Target Plot: computes the distance between the predicted transmitter position which is then fed, along with the current time, to the cumulative average machinery. The bearing of this range is computed here also but is not used. To obtain these results the program proceeds as follows:
 1. If range error is given, it is added to the true range between the receiver and the transmitter to obtain the predicted range.

2. If the predicted range between the receiver and transmitter is given, it is used directly.
 3. The COORD subroutine is now used to obtain the coordinates of the predicted transmitter pointer location.
 4. These coordinates along with the coordinates of the true transmitter position are fed into the RANGE subroutine, the output of which is the desired distance between the predicted and true transmitter locations.
 5. The coordinates of the true transmitter location are then subtracted from the predicted transmitter position and the relative longitude and latitude obtained are used to obtain the bearing of the range computed in step No. 4. (See program flowchart and Figure 1 for details)
- b. **Range Error Plot** determines the range error, which, along with the current time, is fed to the cumulative average machinery. If the range error is given, nothing needs to be done, the range error is used directly. If the predicted range is given, the predicted range minus the true range gives the desired range error. (See program flowchart and Figure 1 for details)
3. Scans the raw data on magnetic tape, computes the cumulative averages and prints the results in a suitable format as they are computed. The cumulative averages are determined by

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i \quad \text{where } \bar{X} \text{ is the cumulative average} \quad (1)$$

A ten-minute average involves all the points within a ten minute interval. Then it is reset and started over. The same applies to the twenty and thirty-minutes averages.

4. Computes a total average and RMS average which are printed out along with the total number of points used in computing these averages. The total average is computed over the whole data run from (1) and is not reset at the end of every specified time interval. The final RMS average, S , uses (1) as follows:

$$S = \left[\frac{1}{n} \sum_{i=1}^n (X_i - \bar{X})^2 \right]^{1/2}$$

$$= \left[\frac{1}{n} \sum_{i=1}^n (X_i^2 - 2X_i\bar{X} + \bar{X}^2) \right]^{1/2}$$

$$= \left[\frac{1}{n} \sum_{i=1}^n X_i^2 + \frac{n\bar{X}^2}{n} - \frac{2\bar{X}}{n} \sum_{i=1}^n X_i \right]^{1/2}$$

$$\text{Therefore } S = \left[\frac{\sum_{i=1}^n X_i^2}{n} - \bar{X}^2 \right]^{1/2} \quad (2)$$

This final equation is the one solved by the program.

C. Section III

1. Punches out the required amount of leader and the proper identification for each class of data.
2. Contains the machinery for scanning the raw data picking up only the data required by the current class. If none is found, the message "NO DATA OF THIS TYPE" is punched on the paper tape along with a stop code for the plotter.
3. Transfers to the next section, if good usable data is picked up in the raw data scan, where it is processed.
4. Punches remainder of data contained in a punch zone (described later) plus a stop code for the X-Y plotter when the end of the raw data is detected.
5. Sets up the proper paper tape identification for the next data class to which it then proceeds to scan.
6. Transfers to an exit zone (See Section V), after scanning the last data class, which determines whether another plot is desired. If so, the program is restarted through channel two (Range error plot) and if not, terminates the program.

D. Section IV - checks to see which plot type is currently being processed and on the basis of this proceeds to either (1) or (2) as follows:

1. Target Plot
 - a. Computes the values of range and bearing as described in Section II paragraph 2a.
 - b. Checks the values of the X and Y components of the range and bearing of the predicted transmitter location to determine whether or not the X and Y components are within certain limits. If these limits are exceeded, the data is printed out and not processed beyond this point.
 - c. Scales the proper values of the X and Y components, assuming that they fulfilled the conditions of the previous step, for the X - Y plotter and restores these numbers into locations common with the Range error channel of this section and exits to the next section.

2. Range Error Plot

- a. Computes the value of the range error as described in Section II, paragraph 2b.
- b. Checks the value of the range error to determine whether or not the range error exceeds a certain limit. If so, the data is rejected and if not, the program proceeds to c.
- c. Determines upon which two-hour-graph the first time for a particular graph falls. For each two-hour-graph that there is no data to plot, the message "NO DATA THIS GRAPH" is punched into the paper tape followed by a stop code for the X - Y plotter.
- d. Determines the parity of the relative time in order to establish an odd hour time reference and an even hour time reference. This step and the preceding one (c & d) are executed only for the first time through on each particular data type.
- e. Compares the current relative time with the odd and even time references. If the current time is odd, it is converted into a suitable negative "time" which fulfills previously mentioned criteria. If the current time is even, no conversion is made. This section also contains the machinery for incrementing the odd and even reference time as necessary. Machinery is also built in to determine if the current time skips a two-hour-graph. If this is true, a suitable message ("NO DATA THIS GRAPH") is punched into the paper tape followed by a stop code. (Details are evident from the flowchart and listing.)
- f. Scales the proper values of range-error and time for the X - Y plotter and restores these numbers into locations common with the Target Plot channel of this section and exits to the next section.

E. Section V

1. Receives the number pairs from Section IV and breaks these down into a sign character and single integers stored in sequential memory locations. (As a result of the scaling done in section IV, the numbers coming into Section V are in the form +dddd, a sign and four digit integer.)
2. Converts the integers into the corresponding characters required by the X - Y plotter.
3. Formats these characters for the X - Y plotter.
4. Contains the machinery for accumulating the character strings in a punch zone which when full is dumped onto paper tape.
5. Determines finally whether or not a second plot is desired and then either exits to SPACE or restarts the program with the running averages (Section II).

In order to operate the X-Y plotter to plot one point, the following information is needed and is entered in the order shown.

- | | | |
|----------------------|---|---------------------------------------|
| 1. X follows | } | X coordinate |
| 2. Sign | | |
| 3. Thousands digit | | |
| 4. Hundreds digit | | |
| 5. Tens digit | | |
| 6. Units digit | | |
| 7. Y follows | } | Y coordinate |
| 8. sign | | |
| 9. Thousands digit | | |
| 10. Hundreds digit | | |
| 11. Tens digit | | |
| 12. Units digit | | |
| 13. Plot instruction | | instructs plotter to plot this point. |

Essentially, then, Section V takes two four-digit integers plus signs and translates these into the above format. In the event that one of the digits can not be translated into the corresponding plotter character, the message "TRANSLATOR ERROR" will appear on the line printer and that data is rejected.

3. LIMITATIONS AND ACCURACY

Although the arithmetic of the two subroutines, RANGE and COORD, is double precision, the arithmetic of this control program is all single precision which limits the accuracy to six decimal digits plus a two digital exponent. This accuracy is more than sufficient since the resolution of the plotter is limited to four significant digits and most of the input data has the same accuracy. Other limitations are discussed in the report on the subroutines, RRL Publication No. 231, but normally these will not be of interest. This program assumes the following sign conventions on longitude and latitude:

- a. longitude east of Greenwich is positive
- b. longitude west of Greenwich is negative
- c. latitude north of the Equator is positive
- d. latitude south of the Equator is negative

In the operation of the X-Y plotter using the proper tapes prepared by this program, there is no stop code after the second hour of each two hour plot of the Range Error vs. Time plot. Therefore, when this hour change occurs, the operator must stop the plotter's paper tape reader and change the sheet of graph paper, otherwise the third and fourth hour, etc. will be plotted over the first and second hour's data, etc. This program will process a data run of up to eight hours duration; this is more than anticipated at the present.

4. COMMON STORAGE AND INDEX REGISTERS

This program requires fourteen memory locations of common storage which are used for communicating with the RANGE and COORD subroutines. The program uses five index registers but no common index registers.

5. OPERATING INSTRUCTIONS - I/O DESCRIPTIONS

The program reads in two cards of initial data which contain the following information.

A. First card

- | | | |
|---|---|--------------------|
| 1. Degrees | } | Receiver longitude |
| 2. Minutes | | |
| 3. Seconds | | |
| 4. Degrees | } | Receiver latitude |
| 5. Minutes | | |
| 6. Seconds | | |
| 7. Time Reference - Hour in which data begins | | |
| 8. Time Reference - Some time in minutes equivalent to one minute less the time on the first data card (i.e. if time on first card is 5.06 minutes, this time reference should be 4.06, etc.) | | |
| 9. Plot - type of plots desired from the program:
This will be an integer 1, 2, or 3 signifying: | | |

- 1 = Target plot only
- 2 = Range Error plot only
- 3 = both Target plot and Range Error plot in that order.

B. Second card

- | | | |
|------------|---|-----------------------|
| 1. Degrees | } | Transmitter longitude |
| 2. Minutes | | |
| 3. Seconds | | |
| 4. Degrees | } | Transmitter latitude |
| 5. Minutes | | |
| 6. Seconds | | |

The remaining cards, which vary in number, contain the raw data which is to be processed.

- | | | |
|--|---|--|
| 1. Azimuth α | } | Punched up by computer interferometer program. |
| 2. Time (in minutes) | | |
| 3. Control Number A | | |
| 4. Predicted Range | } | punched by human operator |
| 5. Range Error | | |
| 6. Control Number B | | |
| 7. Control Number C | | |
| 8. Letters SKIP if time slips an hour | | |
| 9. Letters END to denote end of raw data | | |

The program uses either Predicted Range or Range Error. If Predicted Range is used, enter 0.0 in range error field; if Range Error is used, enter 0.0 in predicted range field.

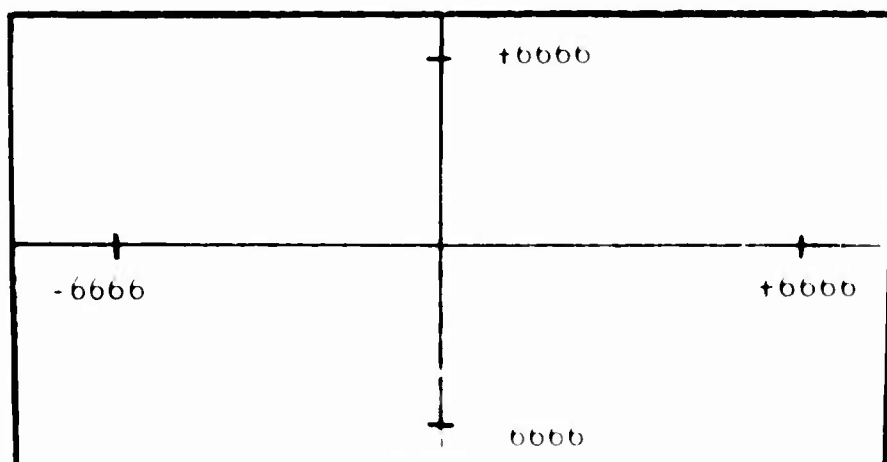
The Control Numbers have the following significance:

- A = 1: 0 - 120 Interferometer Antenna pair type data.
- A = 2: 0 - 240 Interferometer Antenna pair type data.
- B = 1: Propagation mode one hop E type data.
- B = 2: Propagation mode two hop E type data.
- B = 3: Propagation mode one hop F type data.
- C = 1: Predicted Range to be used for this data.
- C = 2: Range Error to be used for this data.

Normally **SKIP** and **END** are absent from these cards. **SKIP** is punched in columns 73-76 of the data card only if time skips one hour. **END** punched in columns 73-80 denote the end of the raw data. Upon detecting **END** on a data card, the computer will begin to process the data read in prior to this card. See Figures 2a and 2b for data card formats.

The calibration procedures for the X-Y plotter are adequately explained in two instruction manuals supplied with this instrument. For the purposes of this program, the plotter is zeroed in the center of a sheet of graph paper and the maximum length available for the positive ordinate axis is made equivalent to 6666 plotter units which implies that the maximum length of the negative ordinate axis is -6666 plotter units. The length of the ordinate axis is then made equivalent to 6666 plotter units on the abscissa (See diagram below). This completes the calibration of the X-Y plotter for both the Target and Range Error vs Time plots. It may be necessary to check this calibration from time to time during the course of plotting a large number of graphs

CALIBRATION DIAGRAM



11 x 17 graph
paper

The coordinates are then plotted using an appropriate paper tape followed by the actual data.

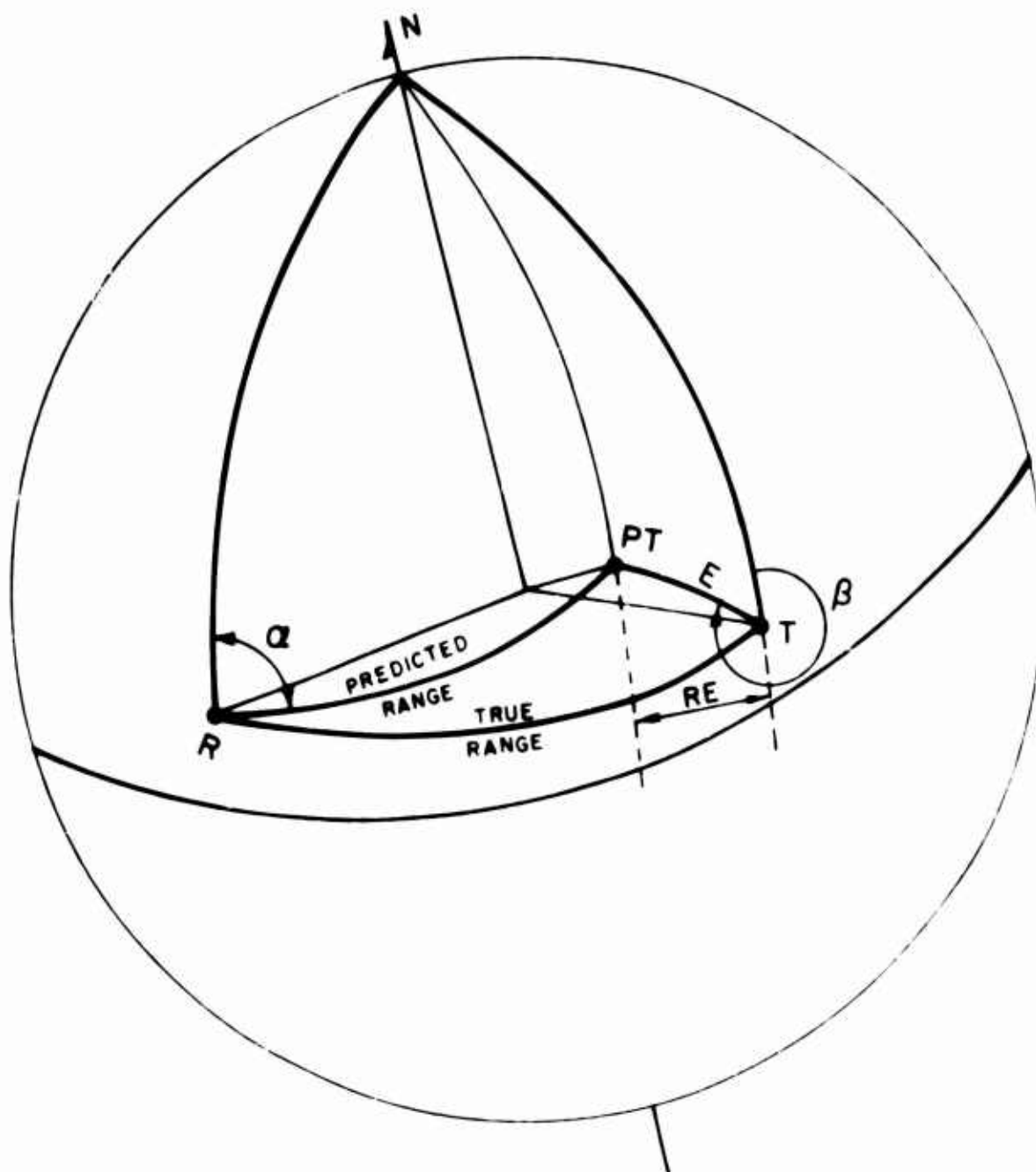


Figure 1. Where: R is the receiver position.

T is the transmitter position.

α is the azimuth of the incoming radiowave.

PT is the predicted transmitter position.

E is the distance between the predicted and the true transmitter position.

β is the bearing of E.

RE is the range error between the true and the predicted transmitter position.

The predicted range and true range are as noted above.

LONGITUDE			LATITUDE			REF TM	OLD TM	NOT USED	PROT
DEGREE	MIN.	SEC	DEGREE	MIN.	SEC				
LN GR 1	LN GR 2	LN GR 3	LAT R 1	LAT R 2	LAT R 3				
0000000	0000000	0000000	0000000	0000000	0000000	000000	000000	000000	000000
1 2 3 4 5 6 7	8 9 10 11 12 13 14	15 16 17 18 19 20 21	22 23 24 25 26 27 28	29 30 31 32 33 34 35	36 37 38 39 40 41	42 43 44 45 46 47	48 49 50 51 52	53 54 55 56 57	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
1111111	1111111	1111111	1111111	1111111	1111111	1111111	1111111	1111111	1111111
2222222	2222222	2222222	2222222	2222222	2222222	2222222	2222222	2222222	2222222
3333333	3333333	3333333	3333333	3333333	3333333	3333333	3333333	3333333	3333333
4444444	4444444	4444444	4444444	4444444	4444444	4444444	4444444	4444444	4444444
5555555	5555555	5555555	5555555	5555555	5555555	5555555	5555555	5555555	5555555
6666666	6666666	6666666	6666666	6666666	6666666	6666666	6666666	6666666	6666666
7777777	7777777	7777777	7777777	7777777	7777777	7777777	7777777	7777777	7777777
8888888	8888888	8888888	8888888	8888888	8888888	8888888	8888888	8888888	8888888
9999999	9999999	9999999	9999999	9999999	9999999	9999999	9999999	9999999	9999999
1 2 3 4 5 6 7	8 9 10 11 12 13 14	15 16 17 18 19 20 21	22 23 24 25 26 27 28	29 30 31 32 33 34 35	36 37 38 39 40 41	42 43 44 45 46 47	48 49 50 51 52	53 54 55 56 57	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

mm 9081

LONGITUDE			LATITUDE		
DEGREE	MIN.	SEC	DEGREE	MIN.	SEC
LN GT 1	LN GT 2	LN GT 3	LAT T 1	LAT T 2	LAT T 3
0000000	0000000	0000000	0000000	0000000	0000000
1 2 3 4 5 6 7	8 9 10 11 12 13 14	15 16 17 18 19 20 21	22 23 24 25 26 27 28	29 30 31 32 33 34 35	36 37 38 39 40 41
1111111	1111111	1111111	1111111	1111111	1111111
2222222	2222222	2222222	2222222	2222222	2222222
3333333	3333333	3333333	3333333	3333333	3333333
4444444	4444444	4444444	4444444	4444444	4444444
5555555	5555555	5555555	5555555	5555555	5555555
6666666	6666666	6666666	6666666	6666666	6666666
7777777	7777777	7777777	7777777	7777777	7777777
8888888	8888888	8888888	8888888	8888888	8888888
9999999	9999999	9999999	9999999	9999999	9999999
1 2 3 4 5 6 7	8 9 10 11 12 13 14	15 16 17 18 19 20 21	22 23 24 25 26 27 28	29 30 31 32 33 34 35	36 37 38 39 40 41

mm 9081

Figure 2a. Initial Data Cards (only two required for one data run.)

ALPH AZIMUTH	TIME TIME	PR PREDICTED RANGE	RE RANGE ERROR	NOT USED	SKIP	END
0000000000	0000000000	0000000000	0000000000	0000000000	0000	0000
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16 17 18 19 20	21 22 23 24 25 26 27 28 29 30	31 32 33 34 35 36 37 38 39 40	41 42 43 44 45 46 47 48 49 50	51 52 53 54 55 56 57 58 59 60	61 62 63 64 65 66 67 68 69 70
1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111
2222222222	2222222222	2222222222	2222222222	2222222222	2222222222	2222222222
3333333333	3333333333	3333333333	3333333333	3333333333	3333333333	3333333333
4444444444	4444444444	4444444444	4444444444	4444444444	4444444444	4444444444
5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
6666666666	6666666666	6666666666	6666666666	6666666666	6666666666	6666666666
7777777777	7777777777	7777777777	7777777777	7777777777	7777777777	7777777777
8888888888	8888888888	8888888888	8888888888	8888888888	8888888888	8888888888
9999999999	9999999999	9999999999	9999999999	9999999999	9999999999	9999999999
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16 17 18 19 20	21 22 23 24 25 26 27 28 29 30	31 32 33 34 35 36 37 38 39 40	41 42 43 44 45 46 47 48 49 50	51 52 53 54 55 56 57 58 59 60	61 62 63 64 65 66 67 68 69 70

Figure 2b. Data Card Sample.

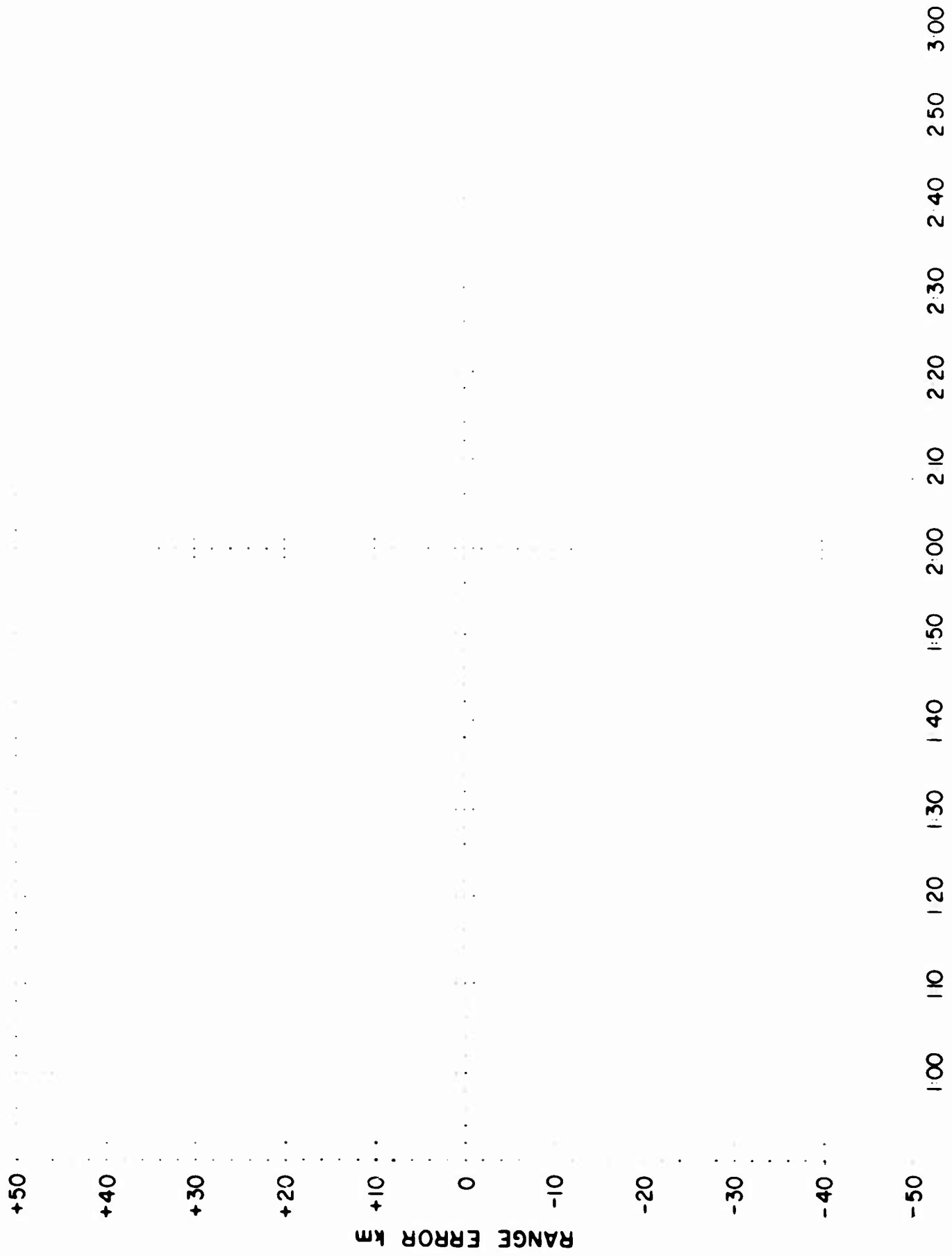


Figure 3a. Range Error vs. Time Plot.



Figure 3b. Range Error vs. Time Coordinates.

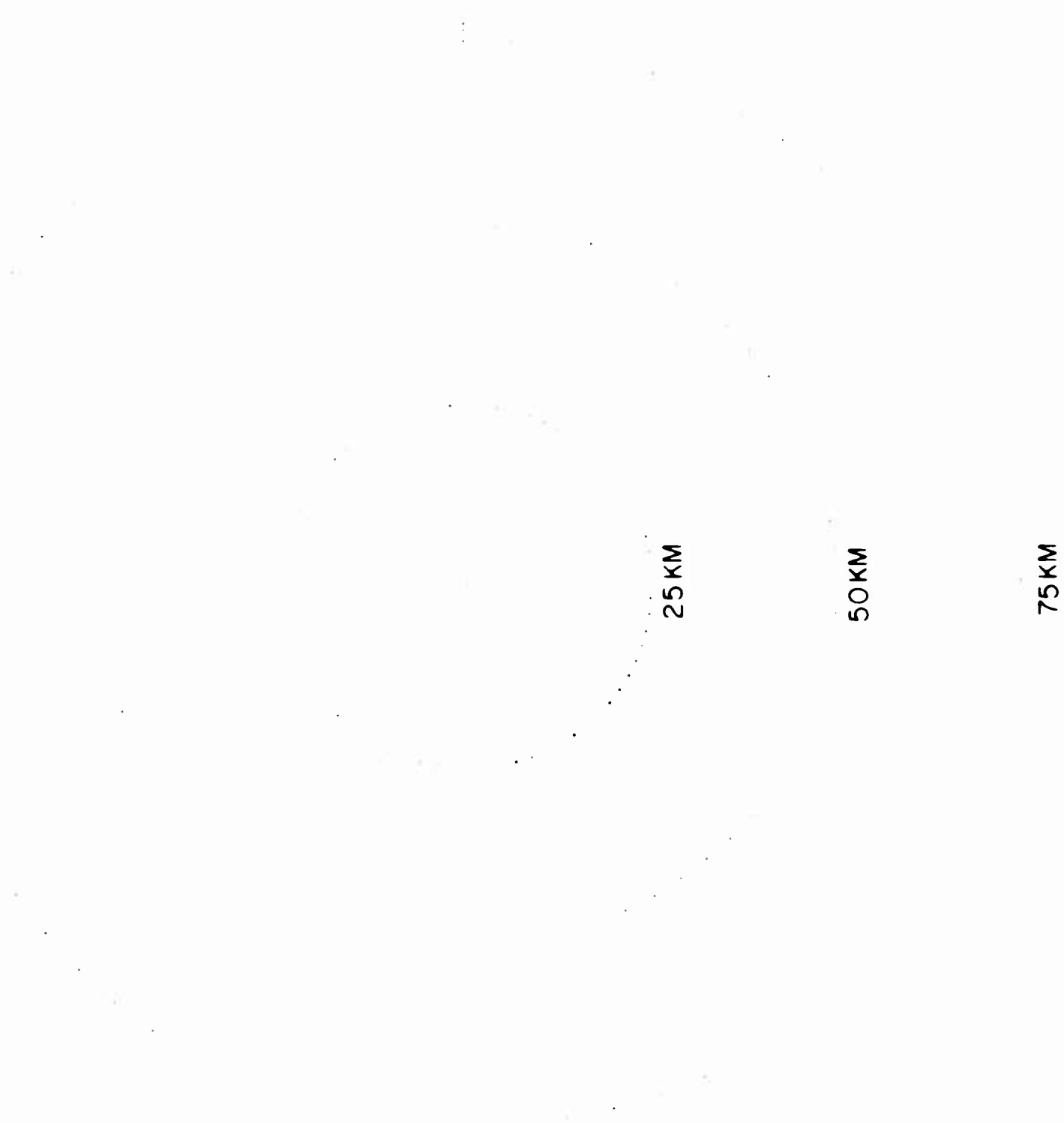


Figure 1. Target Plot Coordinates - Range Circles.

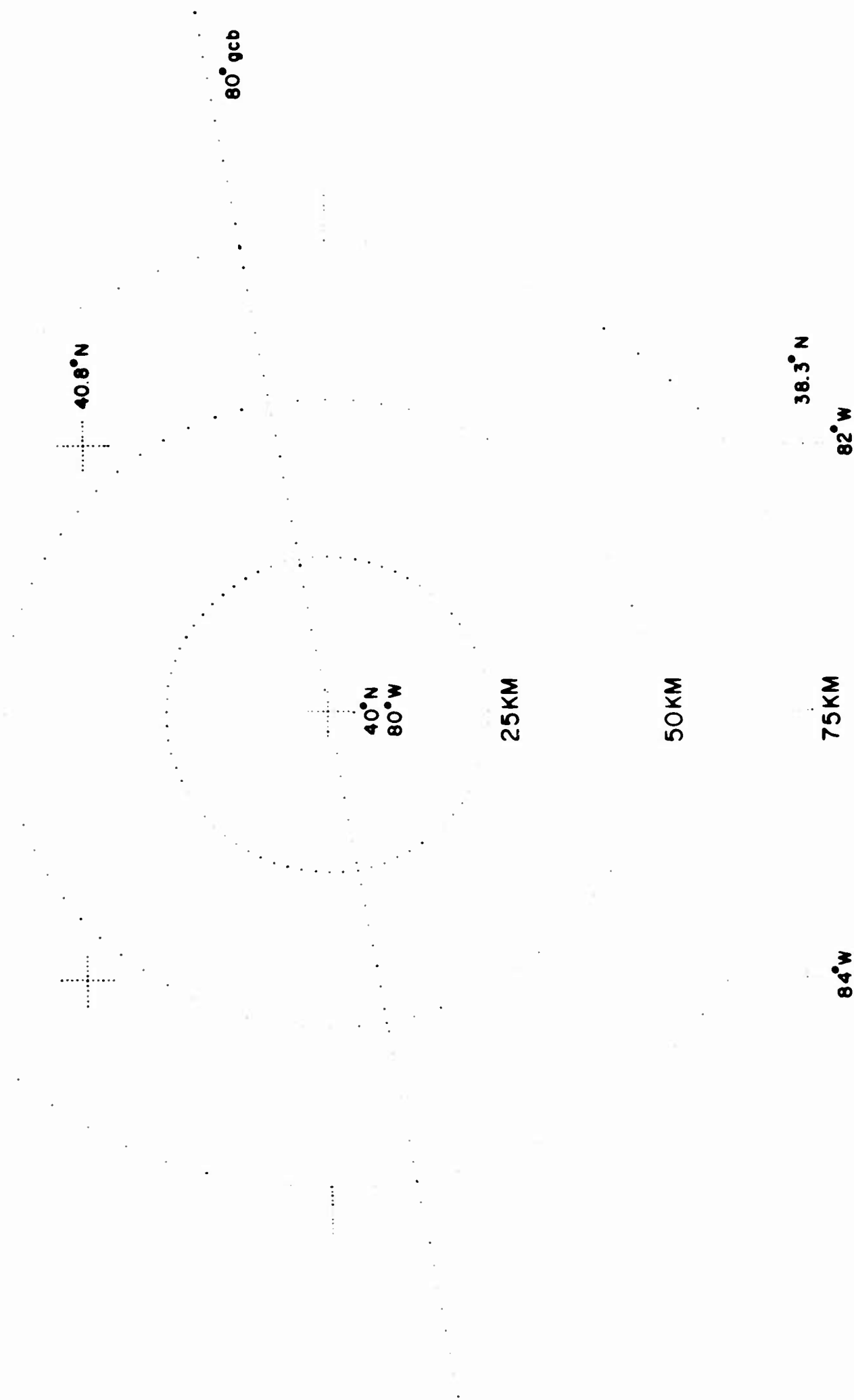


Figure 5. Coordinate Points and Great Circle Bearing Line Marker for Target Plot.

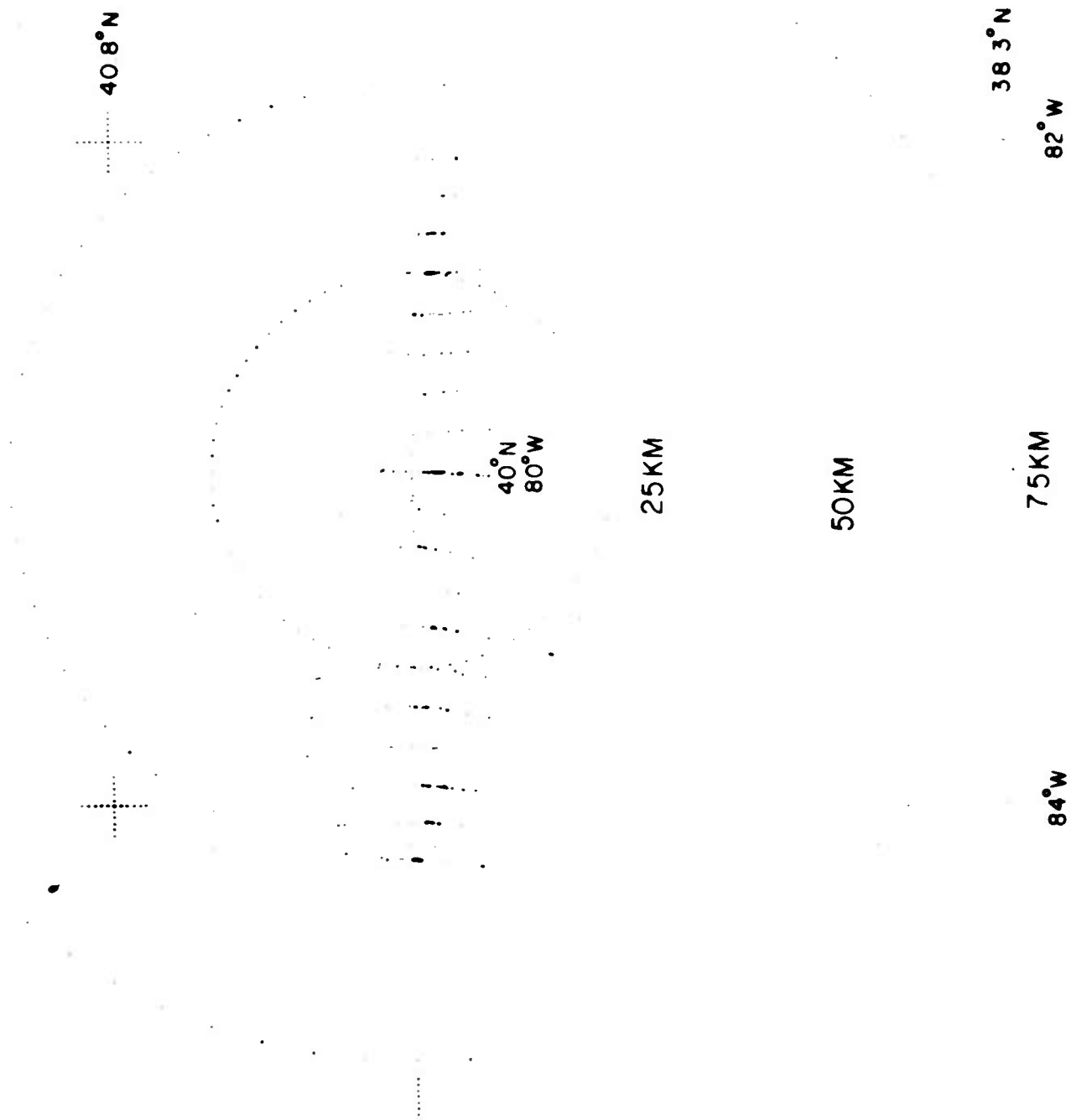
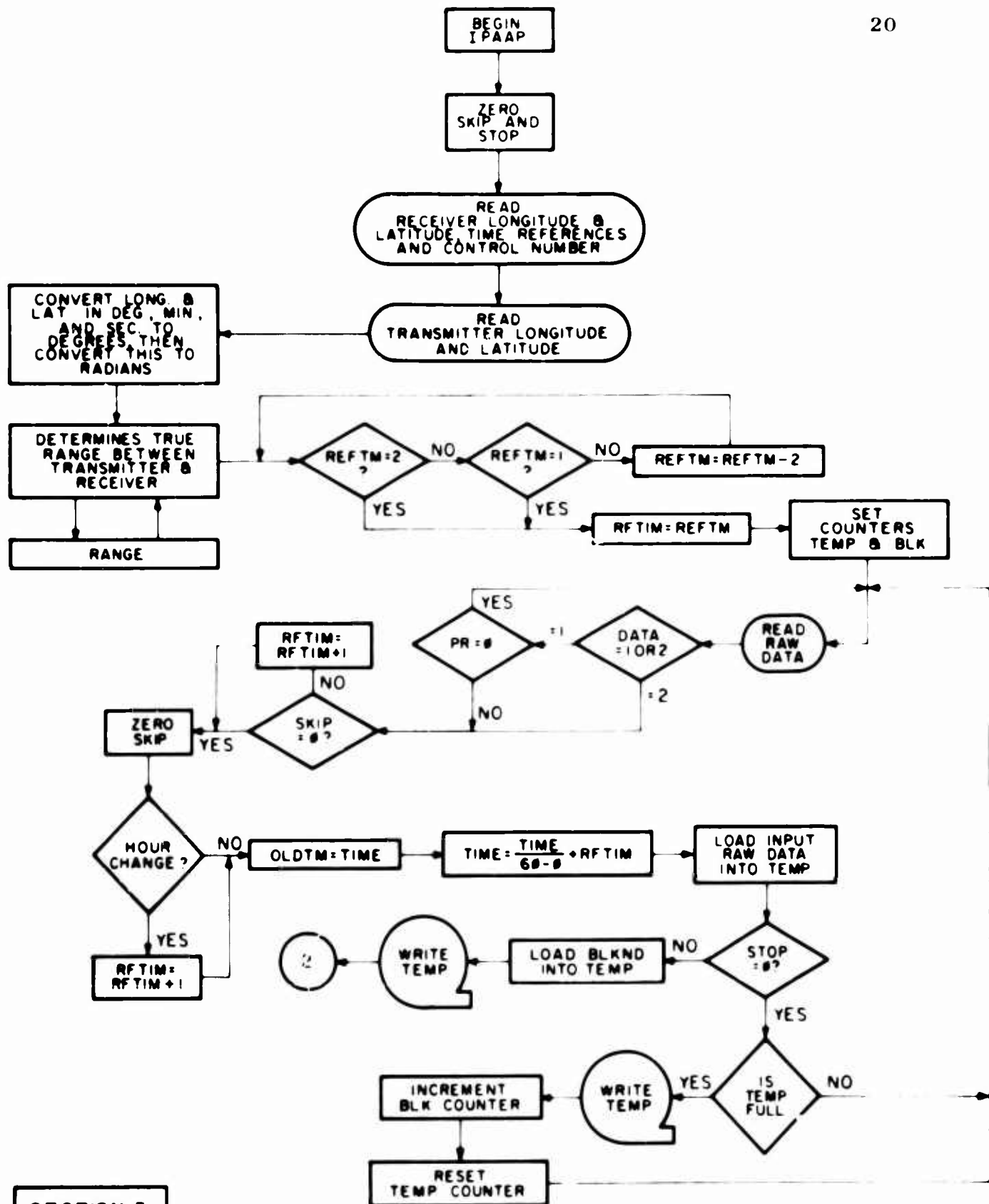
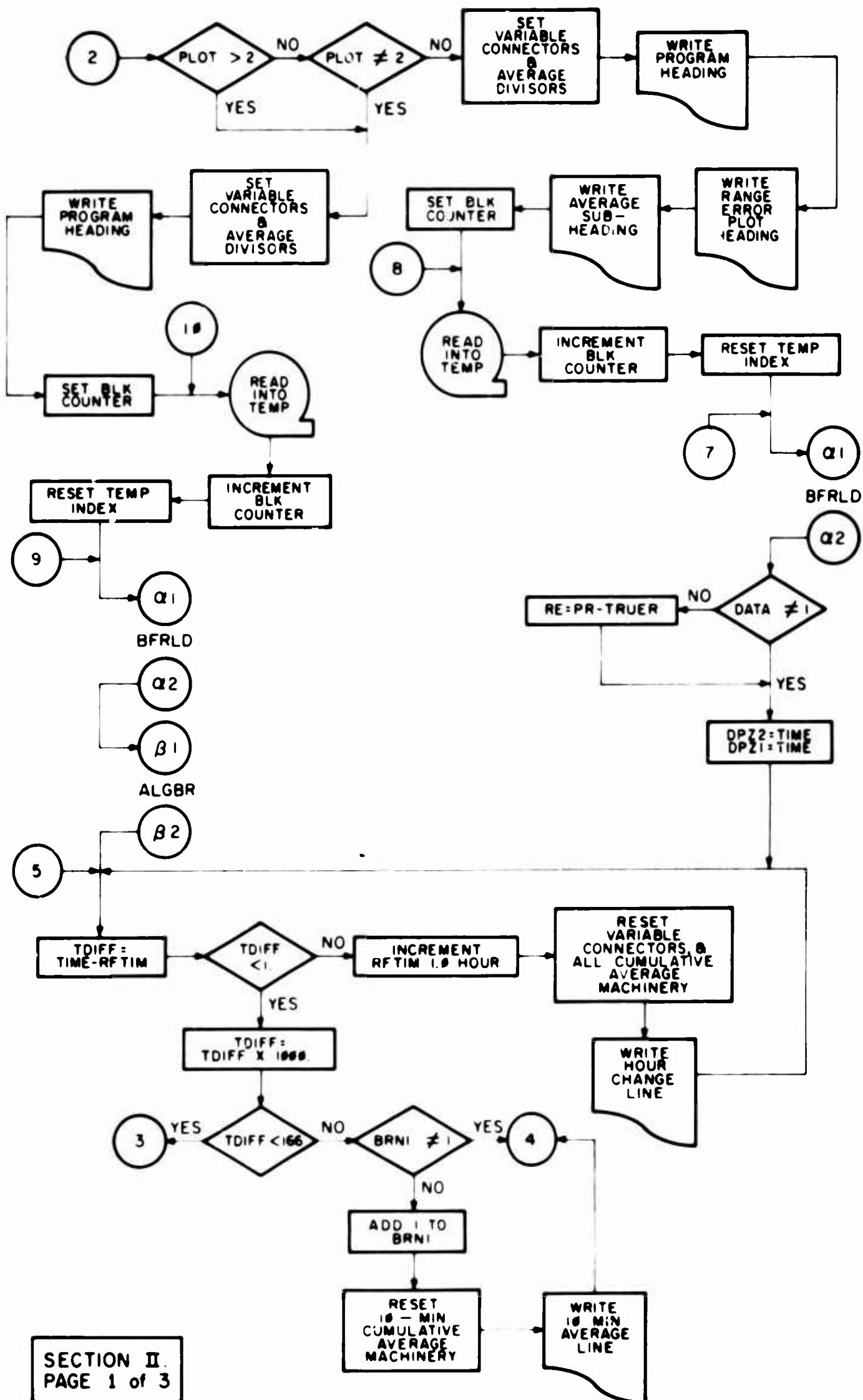
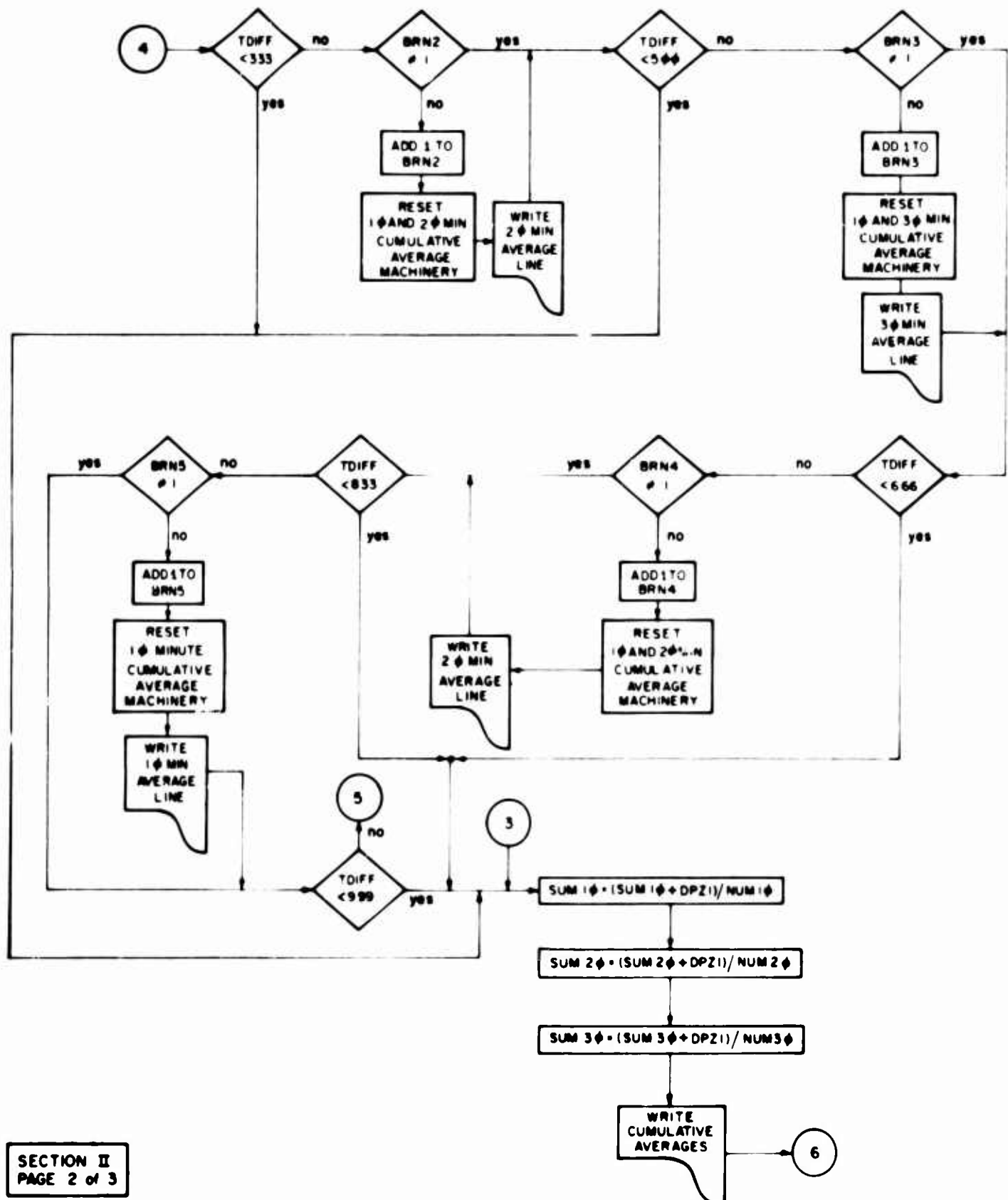


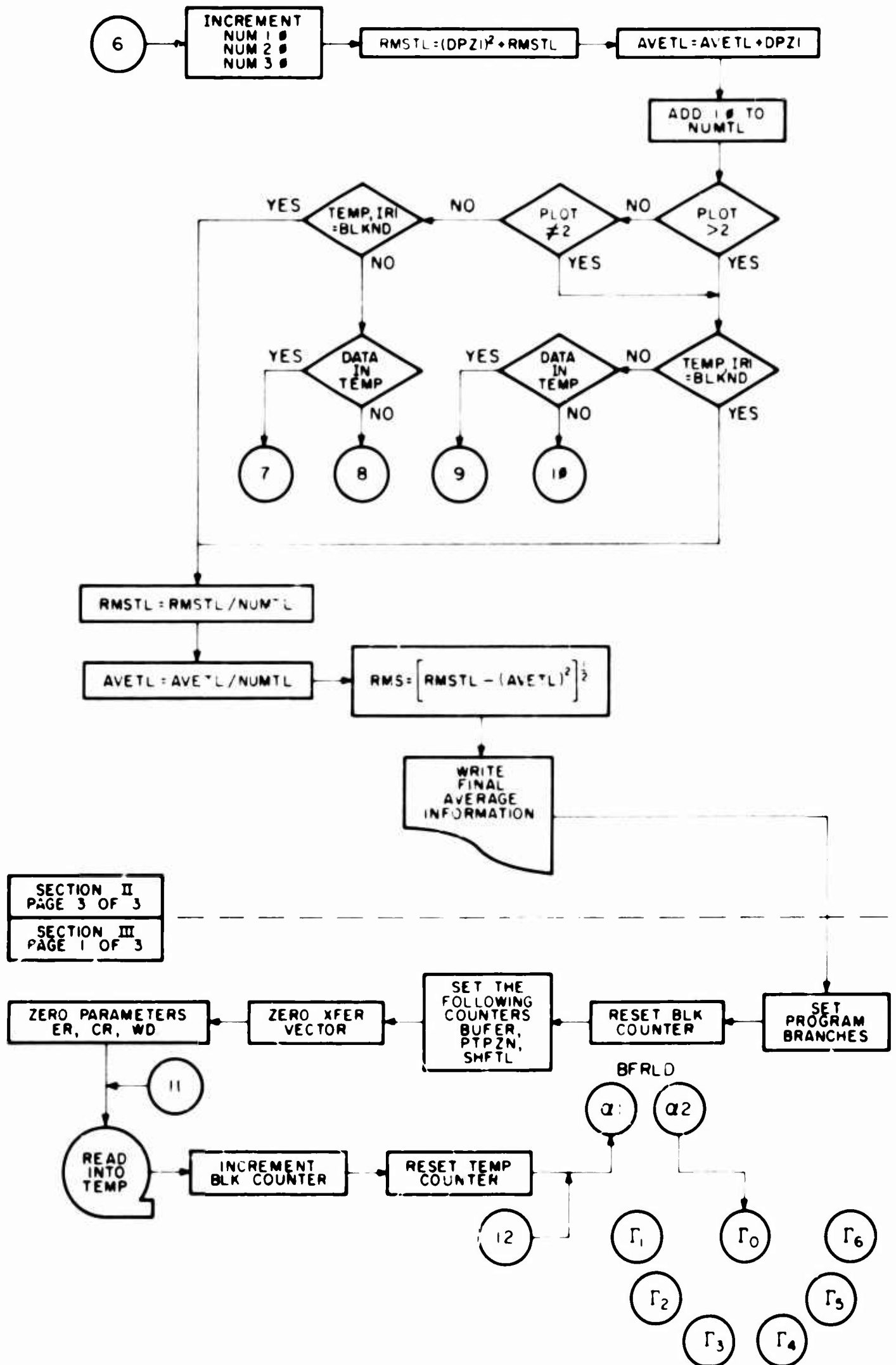
Figure 6. Target Plot (Complete).



SECTION I.
PAGE 1 of 1







Since Γ_2 , Γ_3 , Γ_4 , and Γ_5 are similar to Γ_1 , they have not been drawn.

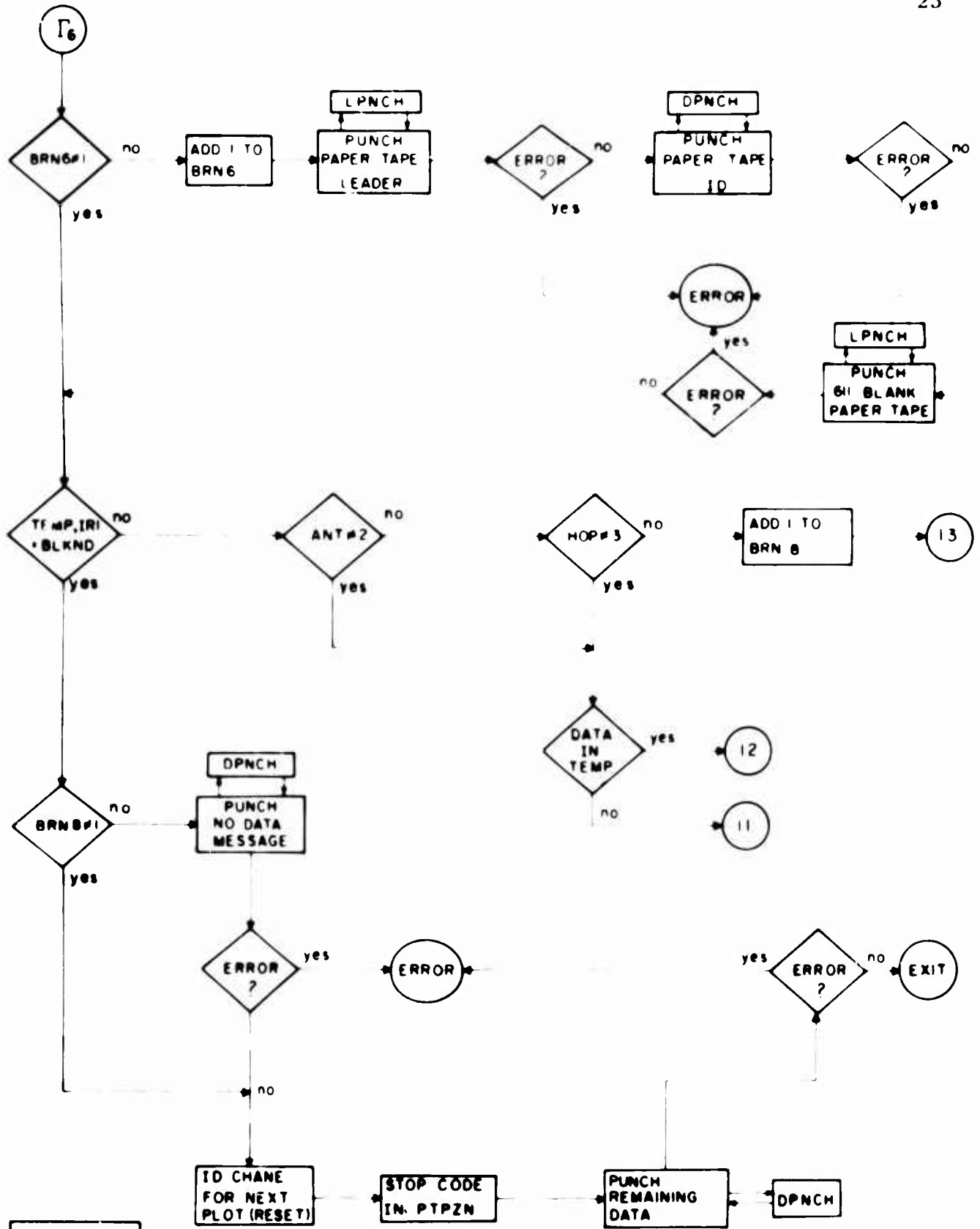
Changes are as follows for

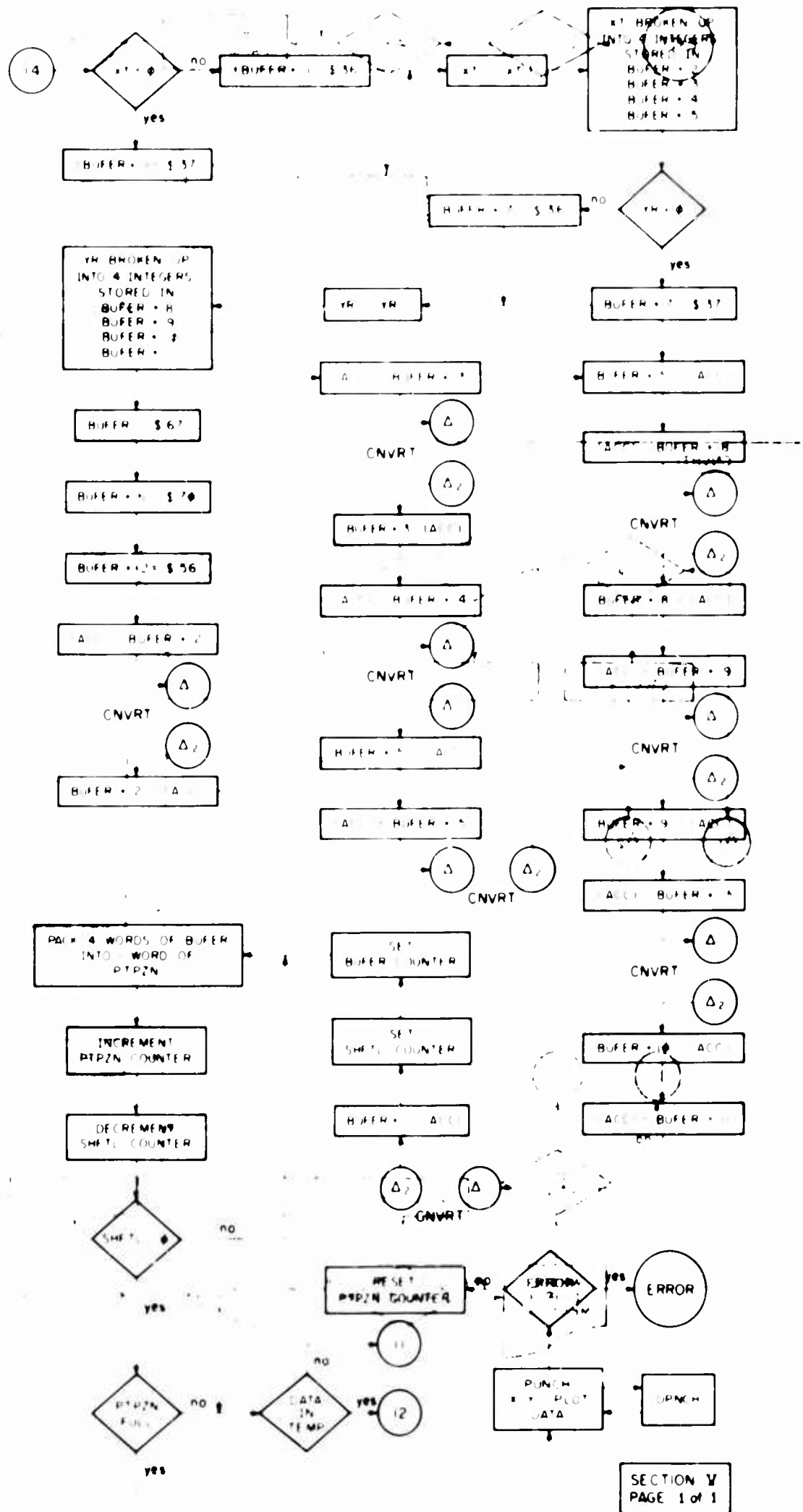
Γ_2 : BRN1 becomes BRN2, $\text{ANT} \neq 1$ remains $\text{ANT} \neq 1$, and $\text{HOP} \neq 1$ becomes
HOP 2.

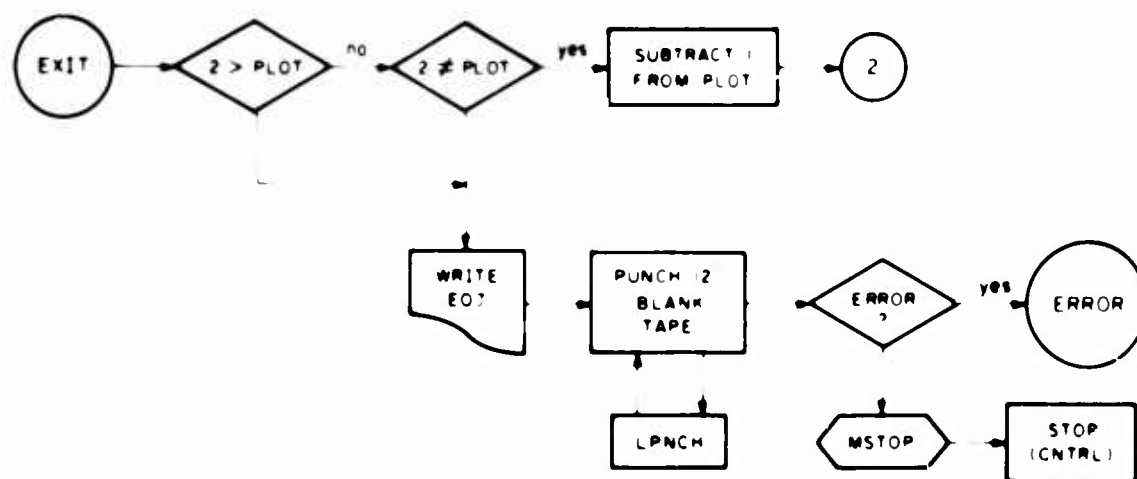
Γ_3 : BRN1 becomes BRN3, $\text{ANT} \neq 1$ remains $\text{ANT} \neq 1$, and $\text{HOP} \neq 1$ becomes
HOP 3.

Γ_4 : BRN1 becomes BRN4, $\text{ANT} \neq 1$ becomes $\text{ANT} \neq 2$, and $\text{HOP} \neq 1$ remains
HOP 1.

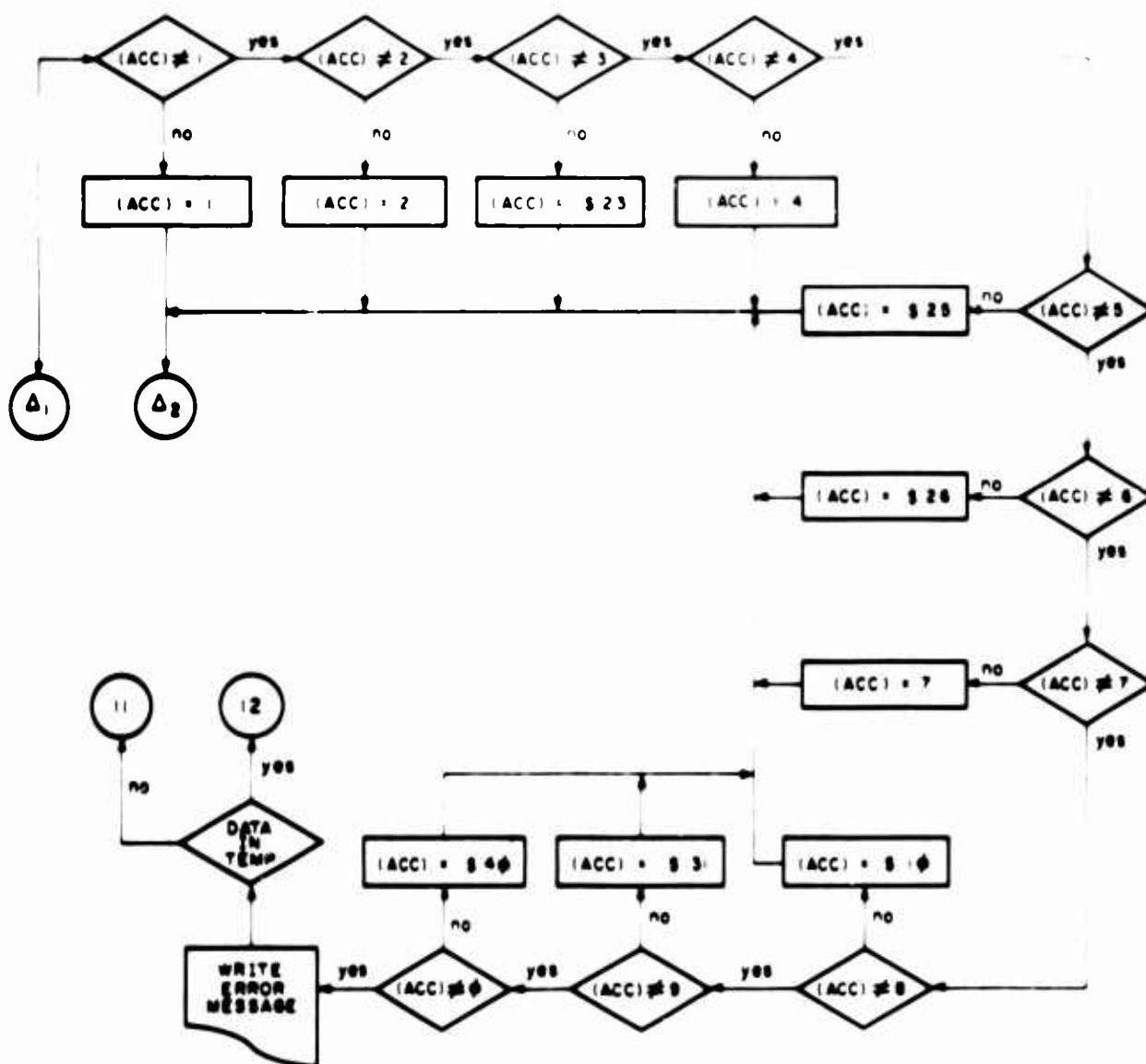
Γ_5 : BRN1 becomes BRN5, $\text{ANT} \neq 1$ becomes $\text{ANT} \neq 2$, and $\text{HOP} \neq 1$ becomes
HOP 2.

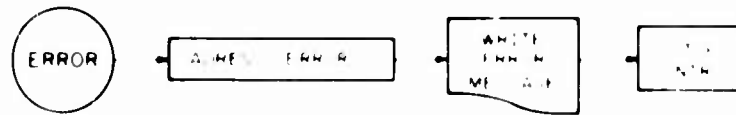




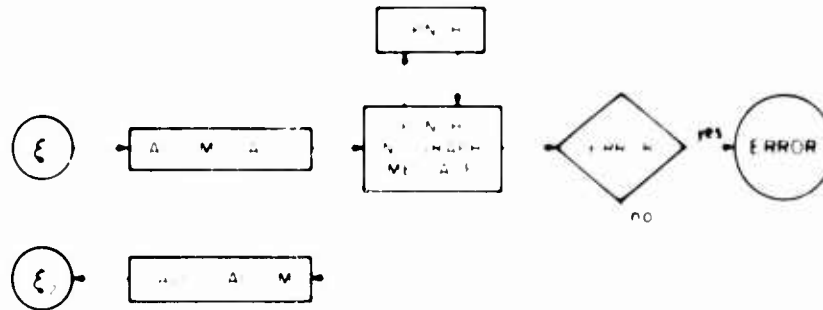


CNVRT

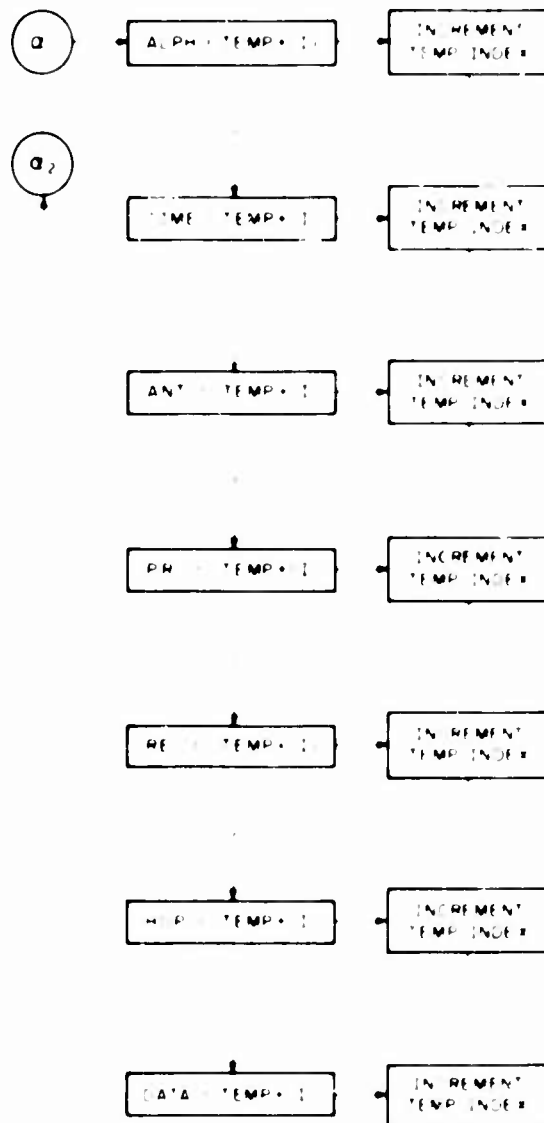


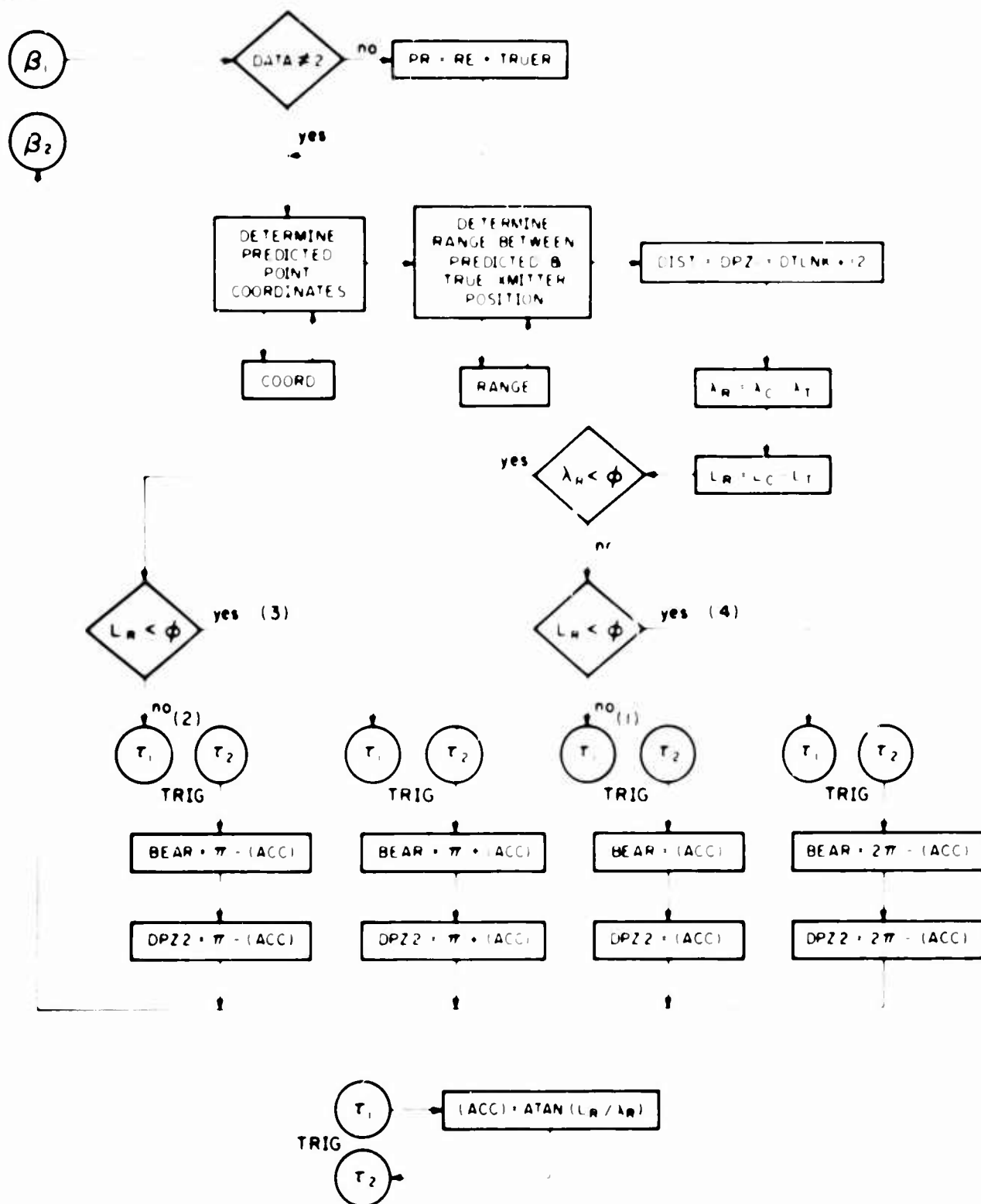


CNT 49



BFRLO





where

λ_R = LONGITUDE, RELATIVE
 λ_C = LONGITUDE, COMPUTED (PIA)
 λ_T = LONGITUDE, TRANSMITTER
 L_R = LATITUDE, RELATIVE
 L_C = LATITUDE, COMPUTED (PIA)
 L_T = LATITUDE, TRANSMITTER

BEGIN IPAPPS
 PRINT EQUIP LNPIH3
 CAMUR EQUIP CHEAD3
 RTAPE EQUIP MAG3
 MES TEMP(250),STDP,SKIP,LNGM1(2),LNGM2(2),LNGR3(2),

MAV A 10
 MAV A 20
 MAV A 30
 MAV A 40
 MAV A 50

014 00001
 014 00401
 014 00402
 014 00403
 014 00405
 014 00407
 014 00411
 014 00413
 014 00415
 014 00417
 014 00420
 014 00421
 014 00422
 014 00423
 014 00424
 014 00425
 014 00426
 014 00427
 014 00430
 014 00431
 014 00433
 014 00435
 014 00437
 014 00441
 014 00443
 014 00445
 014 00446
 014 00447
 014 00450
 014 00451
 014 00456
 014 00456
 014 00459
 014 00461
 014 00462
 014 00463
 014 00464
 014 00465
 014 00466
 014 00467
 014 00470
 014 00471
 014 00472
 014 00473
 014 00474
 014 00475

LATM1(2),LATM2(2),LATM3(2),MEFIM,OLUTM,PLOT,ALPM,TIME, MAV A 60

ANI,PR,ME,POP,DATA,LNGT1(2),LNGT2(2),LNGT3(2),LATI1(2), MAV A 70

LATT2(2),LATT3(2),MT1M,HLK,RMSTL,AVEIL,NUM(L,AUPES, MAV A 80

NUM10,NUM20,NUM30,HRP1,HRP2,HRN3,HRN4,HRN5,HRN6,HRN7, MAV A 90

4

HRN8,DPZ1,DPZ2,IR,UIS1,ICS1,ICS2,ICS3,SUM10,SUM20, MAV A 100

[illegible]

[illegible]

[illegible]


```

013 00260 0 004 0 00 00004 000 000
013 00267 0 004 1 00 00133 000 000
013 00270 0 004 0 00 00001 000 005
013 00271 0 004 0 00 00000 000 000
013 00272 0 004 0 00 03461 000 013
013 00273 0 004 0 00 00000 000 000
013 00274 0 004 0 00 00012 000 000
013 00275 0 004 1 00 00446 000 014
013 00276 0 004 1 00 00133 000 000
013 00277 0 004 0 12 00003 000 005
013 00300 0 004 0 00 00001 000 014
013 00301 1 004 0 00 00377 000 000
013 00302 0 004 0 00 00000 000 014
013 00303 0 004 2 00 00446 000 014
013 00304 0 004 0 00 00001 000 014
013 00305 0 004 0 00 00446 000 014
013 00306 0 004 0 01 00000 001 000
013 00307 0 004 0 00 02525 000 013
013 00310 0 004 2 00 00430 000 014
013 00311 0 004 0 00 00001 000 000
013 00312 0 004 0 00 00316 000 013
013 00313 0 004 2 00 00425 000 014
013 00314 0 004 2 00 00567 000 014
013 00315 0 004 0 00 00426 000 014
013 00316 0 004 2 00 00423 000 014
013 00317 0 004 0 00 00467 000 014
013 00320 0 004 2 00 00426 000 014
013 00321 0 004 0 00 00466 000 014
013 00322 0 004 0 00 00402 000 013
013 00323 0 004 0 00 00447 000 014
013 00324 0 004 0 00 00450 000 014
013 00325 0 004 0 00 00001 000 000
013 00326 0 004 0 00 00451 000 014
013 00327 0 004 0 00 00445 000 014
013 00330 0 004 0 00 00453 000 014
013 00331 0 004 0 00 00454 000 014
013 00332 0 004 0 00 00455 000 014
013 00333 0 004 0 00 00456 000 014
013 00334 0 004 0 00 00457 000 014
013 00335 0 004 0 00 00460 000 014
013 00336 0 004 0 00 00461 000 014
013 00337 0 004 0 00 00462 000 014
013 00340 0 004 1 00 00133 000 000
013 00341 0 004 0 00 00001 000 005
013 00342 0 004 0 00 00000 000 000
013 00343 0 004 0 00 04315 000 013
013 00344 0 004 0 00 00000 000 000
013 00345 0 004 1 00 00133 000 000
013 00346 0 004 0 00 00001 000 005
013 00347 0 004 0 00 00000 000 000
013 00350 0 004 0 00 03301 000 013
013 00351 0 004 0 00 00000 000 000
013 00352 1 004 1 00 00133 000 000
013 00353 0 004 0 00 00001 000 005
013 00354 0 004 0 00 02766 000 013
013 00355 0 004 0 00 03661 000 013

```

WRITE LNPTM,,LNFMG; PRINT SUBHEADING

MAV A 1940

CLA 0103

SET MAG TAPE BLOCK NUMBER
HEAD ONE BLOCK INTO TEMP

MAV A 1950

MAV A 1960
MAV A 1970

UNT6 HLKMD0MAG,TEMP,255,PLK3

CLA 0103

INCREMENT MAG TAPE BLOCK NUMBER

MAV A 1980

PAV A 2000

TEMP COUNTER

TEMP BUFFER LOADER

MAV A 2010

MAV A 2020

MAV A 2030

MAV A 2040

MAV A 2050

MAV A 2060

MAV A 2070

MAV A 2080

MAV A 2090

MAV A 2100

MAV A 2110

MAV A 2120

MAV A 2130

MAV A 2140

MAV A 2150

MAV A 2160

MAV A 2170

MAV A 2180

MAV A 2190

MAV A 2200

MAV A 2210

MAV A 2220

MAV A 2230

MAV A 2240

MAV A 2250

MAV A 2260

MAV A 2263

TO RUNNING AVERAGE DECISION
TARGET PLOT ENTRY POINT
SET THE INDICATED
COUNTERS, ZERO THE INDICATED
LOCATIONS, AND ESTABLISH THE
PROPER VARIABLE CONNECTIONS
SHOWN FOR INITIAL ENTRY
IN THIS SECTION

WRITE LNPTM,,LNFMG;

WRITE LNPTM,,LNFMG;

MAV A 2262

WRITE LNPTM,,LNFMG; PRINT HEADING

MAV A 2270

U13 00356 0 004 0 00 00000 000 000	WRITE LNPTH, LNFMH1	PRINT SUBHEADING	NAV A 2280
U13 00357 0 004 1 00 00133 000 000			
U13 00360 0 004 0 00 00001 000 005			
U13 00361 0 004 0 00 00000 000 000			
U13 00362 0 004 0 00 03461 000 013			
U13 00363 0 004 0 00 00000 000 000			
U13 00364 0 004 0 00 00012 000 000	CLA 0103		NAV A 2290
U13 00365 0 004 0 00 00446 000 014	STI 0103	SET MAG TAPE BLOCK NUMBER	NAV A 2300
U13 00366 0 004 1 00 00133 000 000	UNT11 HLMH00MAG,TEMP,255,RLK3	HEAD ONE BLOCK INTO TEMP	NAV A 2310
U13 00367 0 004 0 12 00003 000 005			
U13 00370 0 004 0 00 00001 000 014			
U13 00371 1 004 0 00 00377 000 000			
U13 00372 0 004 0 00 00000 000 014			
U13 00373 0 004 2 00 00446 000 014			
U13 00374 0 004 0 00 00001 000 000	CLA 0103	INCREMENT MAG TAPE BLOCK NUMBER	NAV A 2320
U13 00375 0 004 0 00 00446 000 014	ADD 0103		NAV A 2330
U13 00376 0 004 0 01 00000 001 000	STI 0103	TEMP COUNTER	NAV A 2340
U13 00377 0 004 0 00 02525 000 013	LXP 001033	TEMP BUFFER LOADER	NAV A 2350
U13 00400 0 004 2 00 00430 000 014	UNT12 TMM		NAV A 2360
U13 00401 0 004 0 00 02554 000 013	CLA 0103	ALGEBRAIC COMPUTATIONS	NAV A 2370
U13 00402 0 004 2 00 00423 000 014	TMM		NAV A 2380
U13 00403 0 004 2 00 00445 000 014	CLA 0103		NAV A 2390
U13 00404 0 004 0 00 00571 000 014	STI 0103	IS TIME DIFFERENTIAL < ONE HOUR	NAV A 2400
U13 00405 0 004 0 00 00001 000 000	STI 0103	YES - CONTINUE	NAV A 2410
U13 00406 0 004 2 00 00445 000 013	TMM	NO - INCREMENT TIME	NAV A 2420
U13 00407 0 004 2 00 00445 000 014	CLA 0103	REFERENCE TO NEXT HOUR	NAV A 2430
U13 00410 0 004 0 00 00001 000 000	ADD 0103		NAV A 2440
U13 00411 0 004 0 00 00445 000 014	STI 0103	RESET THE FOLLOWING	NAV A 2450
U13 00412 0 004 0 00 00001 000 000	CLA 0103	VARIABLE CONNECTIONS	NAV A 2460
U13 00413 0 004 0 00 00456 000 014	STI 0103		NAV A 2470
U13 00414 0 004 0 00 00457 000 014	STI 0103		NAV A 2480
U13 00415 0 004 0 00 00460 000 014	STI 0103		NAV A 2490
U13 00416 0 004 0 00 00461 000 014	STI 0103		NAV A 2500
U13 00417 0 004 0 00 00462 000 014	STI 0103		NAV A 2510
U13 00420 0 004 0 00 00453 000 014	STI 0103	RESET RUNNING AVERAGE MACHINERY	NAV A 2520
U13 00421 0 004 0 00 00454 000 014	STI 0103		NAV A 2530
U13 00422 0 004 0 00 00455 000 014	STI 0103		NAV A 2540
U13 00423 0 004 0 00 00475 000 014	STI 0103		NAV A 2550
U13 00424 0 004 0 00 00476 000 014	STI 0103		NAV A 2560
U13 00425 0 004 0 00 00477 000 014	STI 0103		NAV A 2570
U13 00426 0 004 0 00 00500 000 014	STI 0103		NAV A 2580
U13 00427 0 004 0 00 00501 000 014	STI 0103		NAV A 2590
U13 00430 0 004 0 00 00502 000 014	STI 0103	PRINT DOUBLE LINE - HOUR CHANGE	NAV A 2600
U13 00431 0 004 1 00 00133 000 000	UNT13 LNPTH, LNFMH1		NAV A 2610
U13 00432 0 004 0 00 00001 000 005			NAV A 2620
U13 00433 0 004 0 00 00000 000 000			
U13 00434 0 004 0 00 03761 000 013			
U13 00435 0 004 0 00 00000 000 000			
U13 00436 0 004 0 00 00402 000 013	TMM	TRY AGAIN	NAV A 2630
U13 00437 0 004 2 00 00571 000 014	CLA 0103	TIME DIFFERENTIAL = SUM	NAV A 2640
U13 00440 0 004 0 00 00475 000 000	STI 0103	NUMBER 1 SUCH THAT JOKES1000	NAV A 2650
U13 00441 0 004 0 00 00571 000 014	STI 0103		NAV A 2660
U13 00442 0 004 0 00 00446 000 000	STI 0103	IS TIME < FIRST 10 MINUTES	NAV A 2670
U13 00443 0 004 0 00 00603 000 013	TMM	YES - GO TO RUNNING AVERAGES	NAV A 2680
U13 00444 0 004 2 00 00456 000 014	CLA 0103	NO - TEST BRANCH	NAV A 2690
U13 00445 0 004 0 00 00001 000 000	UNT14	IS THIS THE FIRST TIME THROUGH	NAV A 2700

NO - CONTINUE AT THE NEXT TEST
 YES - CHANGE BRANCH
 HAV A 2710
 HAV A 2720
 HAV A 2730
 HAV A 2740
 HAV A 2750
 HAV A 2760
 HAV A 2770
 HAV A 2780

NO - CONTINUE AT THE NEXT TEST
 YES - CHANGE BRANCH
 HAV A 2710
 HAV A 2720
 HAV A 2730
 HAV A 2740
 HAV A 2750
 HAV A 2760
 HAV A 2770
 HAV A 2780

NO - CONTINUE AT THE NEXT TEST
 YES - CHANGE BRANCH
 HAV A 2710
 HAV A 2720
 HAV A 2730
 HAV A 2740
 HAV A 2750
 HAV A 2760
 HAV A 2770
 HAV A 2780

IS TIME < FIRST 20 MINUTES
 YES - GO TO RUNNING AVERAGES
 NO - TEST BRANCH
 IS THIS THE FIRST TIME THROUGH
 NO - CONTINUE AT THE NEXT TEST
 YES - CHANGE BRANCH
 HAV A 2790
 HAV A 2800
 HAV A 2810
 HAV A 2820
 HAV A 2830
 HAV A 2840
 HAV A 2850
 HAV A 2860
 HAV A 2870
 HAV A 2880
 HAV A 2890
 HAV A 2900
 HAV A 2910
 HAV A 2920
 HAV A 2930
 HAV A 2940

IS TIME < FIRST 20 MINUTES
 YES - GO TO RUNNING AVERAGES
 NO - TEST BRANCH
 IS THIS THE FIRST TIME THROUGH
 NO - CONTINUE AT THE NEXT TEST
 YES - CHANGE BRANCH
 HAV A 2790
 HAV A 2800
 HAV A 2810
 HAV A 2820
 HAV A 2830
 HAV A 2840
 HAV A 2850
 HAV A 2860
 HAV A 2870
 HAV A 2880
 HAV A 2890
 HAV A 2900
 HAV A 2910
 HAV A 2920
 HAV A 2930
 HAV A 2940

IS TIME < FIRST 20 MINUTES
 YES - GO TO RUNNING AVERAGES
 NO - TEST BRANCH
 IS THIS THE FIRST TIME THROUGH
 NO - CONTINUE AT THE NEXT TEST
 YES - CHANGE BRANCH
 HAV A 2790
 HAV A 2800
 HAV A 2810
 HAV A 2820
 HAV A 2830
 HAV A 2840
 HAV A 2850
 HAV A 2860
 HAV A 2870
 HAV A 2880
 HAV A 2890
 HAV A 2900
 HAV A 2910
 HAV A 2920
 HAV A 2930
 HAV A 2940

IS TIME < FIRST 30 MINUTES
 YES - GO TO RUNNING AVERAGES
 NO - TEST BRANCH
 IS THIS THE FIRST TIME THROUGH
 NO - CONTINUE AT THE NEXT TEST
 YES - CHANGE BRANCH
 HAV A 3050
 HAV A 3060
 HAV A 3070
 HAV A 3080
 HAV A 3090
 HAV A 3100
 HAV A 3110
 HAV A 3120
 HAV A 3130
 HAV A 3140

IS TIME < FIRST 30 MINUTES
 YES - GO TO RUNNING AVERAGES
 NO - TEST BRANCH
 IS THIS THE FIRST TIME THROUGH
 NO - CONTINUE AT THE NEXT TEST
 YES - CHANGE BRANCH
 HAV A 3050
 HAV A 3060
 HAV A 3070
 HAV A 3080
 HAV A 3090
 HAV A 3100
 HAV A 3110
 HAV A 3120
 HAV A 3130
 HAV A 3140

IS TIME < FIRST 30 MINUTES
 YES - GO TO RUNNING AVERAGES
 NO - TEST BRANCH
 IS THIS THE FIRST TIME THROUGH
 NO - CONTINUE AT THE NEXT TEST
 YES - CHANGE BRANCH
 HAV A 3050
 HAV A 3060
 HAV A 3070
 HAV A 3080
 HAV A 3090
 HAV A 3100
 HAV A 3110
 HAV A 3120
 HAV A 3130
 HAV A 3140

013	00536	0	FUB	0	00	00001	000	014
013	00537	0	TMA	0	00	00556	000	013
013	00540	0	ALU	0	00	00001	000	010
013	00541	0	STI	0	00	00461	000	014
013	00542	0	STZ	0	00	00475	000	014
013	00543	0	STZ	0	00	00476	000	014
013	00544	0	STZ	0	00	00500	000	014
013	00545	0	STZ	0	00	00501	000	014
013	00546	0	CLA	0	00	00001	000	010
013	00547	0	STB	0	00	00453	000	014
013	00551	0	STB	0	00	00454	000	014
013	00551	0	TMA	1	00	00133	000	010

PRINT 40 MINUTE DOTTED LINE

013	00556	0	CLA	2	00	00571	000	014
013	00557	0	FLO	0	00	01501	000	000
013	00560	0	TMA	0	00	00603	000	013
013	00551	0	CLA	2	00	00462	000	014
013	00562	0	FLO	0	00	00001	000	000
013	00563	0	TMA	0	00	00577	000	013
013	00564	0	ADL	0	00	00001	000	000
013	00565	0	STI	0	00	00462	000	014
013	00565	0	SIC	0	00	00472	000	014
013	00567	0	STI	0	00	00500	000	014
013	00570	0	CLA	0	00	00053	000	000
013	00571	0	STI	0	00	00453	000	014
013	00572	0	TMA	1	00	00133	000	000

PRINT 50 MINUTE DOTTED LINE

013	00577	0	CLA	2	00	00571	000	014
013	00600	0	FLU	0	00	01747	000	010
013	00604	0	TMA	0	00	00603	000	013
013	00602	0	TMA	0	50	00402	000	013
013	00604	0	CLA	2	00	00475	000	014
013	00604	0	ADU	2	00	00466	000	014
013	00605	0	CLS	0	00	00475	000	014
013	00604	0	PIV	2	00	00453	000	014
013	00607	0	CLS	0	00	00500	000	014
013	00611	0	CLA	2	00	00476	000	014
013	00611	0	ADI	2	00	00466	000	014
013	00612	0	CLS	0	00	00476	000	014
013	00613	0	PIV	2	00	00454	000	014
013	00614	0	CLS	0	00	00501	000	014
013	00615	0	CLA	2	00	00477	000	014
013	00615	0	ADI	2	00	00466	000	014
013	00617	0	CLS	0	00	00477	000	014
013	00620	0	PIV	2	00	00455	000	014
013	00621	0	CLS	0	00	00502	000	014
013	00622	0	TMA	1	00	00133	000	000

30 MINUTE RUNNING AVERAGE PRINT RESULTS

WRIE LNP TH, LNL SP, LAF MP;

013 00626 0 001 0 00 00000 000 014
 013 00627 0 001 0 00 00453 000 014
 013 00630 0 001 0 00 00001 000 014
 013 00631 0 001 0 00 00453 000 014
 013 00632 0 001 0 00 00454 000 014
 013 00633 0 001 0 00 00001 000 014
 013 00634 0 001 0 00 00454 000 014
 013 00635 0 001 0 00 00455 000 014
 013 00636 0 001 0 00 00001 000 014
 013 00637 0 001 0 00 00455 000 014
 013 00640 0 001 0 00 00456 000 014
 013 00641 0 001 0 00 00456 000 014
 013 00642 0 001 0 00 00457 000 014
 013 00643 0 001 0 00 00457 000 014
 013 00644 0 001 0 00 00456 000 014
 013 00645 0 001 0 00 00450 000 014
 013 00646 0 001 0 00 00450 000 014
 013 00647 0 001 0 00 00451 000 014
 013 00650 0 001 0 00 00001 000 014
 013 00651 0 001 0 00 00451 000 014
 013 00652 0 001 0 00 00002 000 014
 013 00653 0 001 0 00 00421 000 014
 013 00654 0 001 0 00 00607 000 013
 013 00655 0 001 0 00 00421 000 014
 013 00656 0 001 0 00 00607 000 013
 013 00657 0 001 0 00 00001 001 014
 013 00658 0 001 0 00 00001 000 014
 013 00659 0 001 0 00 00001 000 014
 013 00660 0 001 0 00 00001 000 014
 013 00661 0 001 0 00 00603 000 013
 013 00662 0 001 0 00 00607 000 013
 013 00663 0 001 0 00 00001 000 014
 013 00664 0 001 0 00 00374 000 013
 013 00665 0 001 0 00 00307 000 013
 013 00666 0 001 0 00 00276 000 013
 013 00667 0 001 0 00 00001 001 014
 013 00670 0 001 0 00 00001 000 013
 013 00671 0 001 0 00 00603 000 013
 013 00672 0 001 0 00 00607 000 013
 013 00673 0 001 0 00 00001 000 014
 013 00674 0 001 0 00 00374 000 013
 013 00675 0 001 0 00 00377 000 013
 013 00676 0 001 0 00 00366 000 013
 013 00677 0 001 0 00 00447 000 014
 013 00700 0 001 0 00 00421 000 014
 013 00701 0 001 0 00 00347 000 014
 013 00702 0 001 0 00 00450 000 014
 013 00703 0 001 0 00 00451 000 014
 013 00704 0 001 0 00 00450 000 014
 013 00705 0 001 0 00 00450 000 014
 013 00706 0 001 0 00 00450 000 014
 013 00707 0 001 0 00 00627 000 014
 013 00710 0 001 0 00 00447 000 014
 013 00711 0 001 0 00 00627 000 014
 013 00712 0 001 0 00 00627 000 014
 013 00713 0 001 0 00 00611 000 014
 013 00714 0 001 0 00 00627 000 014
 013 00715 0 001 0 00 00630 000 014

UNIT 1

UNIT 2

UNIT 3

UNIT 4

UNIT 5

UNIT 6

UNIT 7

INTERMEDIATE RMS RESULTS

INTERMEDIATE TOTAL AVERAGE RESULTS

TARGET PLOT TRANSFER

TARGET PLOT TRANSFER

WANG EKROU ENTRY

TEST FOR END OF RAW DATA

THERE IS MORE RAW DATA

END OF RAW DATA TRANSFER POINT

IS THERE DATA IN TEMP

YES - LOAD DATA BUFFER

NO - HEAD IN NEW BLOCK

TARGET PLOT ENTRY

TEST FOR END OF RAW DATA

THERE IS MORE RAW DATA

END OF RAW DATA TRANSFER POINT

IS THERE DATA IN TEMP

YES - LOAD DATA BUFFER

NO - HEAD IN A NEW BLOCK

FINAL COMPUTATIONS

TO DETERMINE THE

TOTAL AVERAGE

AND THE

TOTAL RMS AVERAGE


```

013 01002 0 100 1 00 00015 000 014
013 01006 0 000 0 00 03074 000 013
013 01007 0 000 0 00 00573 000 014
013 01010 0 000 0 00 00574 000 014
013 01011 0 000 2 10 00574 000 014
013 01012 0 000 0 00 02672 000 013
013 01013 0 000 0 00 00074 000 000
013 01014 0 000 0 00 00573 000 014
013 01015 0 000 1 00 00013 000 004
013 01016 0 000 0 00 00573 000 014
013 01017 0 000 0 00 00574 000 014
013 01020 0 000 2 10 00574 000 014
013 01021 0 000 0 00 02672 000 013
013 01022 0 000 2 01 00001 001 014
013 01023 0 000 2 00 03071 000 013
013 01024 0 000 2 00 02025 000 013
013 01025 0 000 0 00 01044 000 013
013 01026 0 000 2 00 00424 000 014
013 01027 0 000 0 00 00001 000 000
013 01030 0 000 0 00 01040 000 013
013 01031 0 000 2 00 00427 000 014
013 01032 0 000 0 00 01040 000 000
013 01033 0 000 0 00 01040 000 013
013 01034 0 000 2 00 00465 000 014
013 01035 0 000 0 00 00001 000 000
013 01036 0 000 0 00 00465 000 014
013 01037 0 000 0 00 01577 000 013
013 01040 0 000 2 00 00001 000 001
013 01041 0 000 0 00 00374 000 000
013 01042 0 000 0 00 00757 000 013
013 01043 0 000 0 00 00746 000 013
013 01044 0 000 2 00 00465 000 014
013 01045 0 000 0 00 00001 000 000
013 01046 0 000 0 00 01057 000 013
013 01047 0 000 0 00 00210 000 000
013 01050 0 000 0 00 00573 000 014
013 01051 0 000 1 00 00015 000 004
013 01052 0 000 0 00 03120 000 013
013 01053 0 000 0 00 00573 000 014
013 01054 0 000 0 00 00574 000 014
013 01055 0 000 2 00 00574 000 014
013 01056 0 000 0 00 02672 000 013
013 01057 0 000 0 05 00001 001 000
013 01060 0 000 2 00 03162 000 013
013 01061 0 000 0 00 03105 000 013
013 01062 0 000 2 00 03163 000 013
013 01063 0 000 0 00 03106 000 013
013 01064 0 000 0 00 00001 000 000
013 01065 0 000 0 00 00464 000 014
013 01066 0 000 0 00 00465 000 014
013 01067 0 000 0 00 00012 000 000
013 01070 0 000 0 00 00446 000 014
013 01071 0 000 2 00 03072 000 013
013 01072 0 000 0 03 00503 001 014
013 01073 0 000 2 00 00572 000 014
013 01074 0 000 0 00 00004 000 000

```

SUMMI LUNCH(MESG1,CR,EM); PUNCH PAPER TAPE HEADING; HAV A 4590
 FOP END; TEST FOR SUBROUTINE ERROR; HAV A 4590
 TRM ERROR; ERROR EXIT; HAV A 4610
 CLA UNO; HAV A 4620
 STI UNO; HAV A 4630
 SUMMI LUNCH(CR,EM); PUNCH LEADER; HAV A 4640
 FOP END; TEST FOR SUBROUTINE ERROR; HAV A 4650
 TRM ERROR; ERROR EXIT; HAV A 4660
 CLA TEMP,IM1; TEST FOR END OF HAV DATA; HAV A 4670
 UNO HLKND; IS THERE HAV DATA LEFT; HAV A 4680
 TRM NEXT + 13; DATA TO BE ANALYZED; HAV A 4690
 TRM NEXT + 14; END OF 0-120 ONE-WOP DATA; HAV A 4700
 CLA UNO; IS DATA 0-120 TYPE; HAV A 4710
 FOP UNO; NO; HAV A 4720
 TRM NEXT + 73; YES - AND PROCURED; HAV A 4730
 CLA UNO; IS DATA ONE-WOP TYPE; HAV A 4740
 FOP UNO; NO; HAV A 4750
 TRM NEXT + 43; YES - PROCURED AND SET; HAV A 4760
 CLA HAVND; VARIABLE CONNECTOR; HAV A 4770
 ADD UNO; HAV A 4780
 STI HAVND; DATA AVAILABLE; HAV A 4790
 TRM UNO31; HAV A 4800
 CLA 2IM1; IS THERE DATA LEFT IN TEMP; HAV A 4810
 FLO UNO21; YES - LOAD DATA BUFFER; HAV A 4820
 TRM UNO23; NO - READ IN NEW BLOCK; HAV A 4830
 TRM UNO22; HAV A 4840
 CLA HAVND; HAV A 4850
 FOP UNO; HAV A 4860
 TRM UNO32; HAV A 4870
 CLA UNO31; NO 0-120 THE DATA; HAV A 4880
 STI UNO; NO DATA MESSAGE; HAV A 4890
 SUMMI LUNCH(MESG2,CR,EM); NO DATA MESSAGE; HAV A 4900
 FOP END; TEST FOR SUBROUTINE ERROR; HAV A 4910
 TRM ERROR; ERROR EXIT; HAV A 4920
 CLA YESG1; SET NEXT SCAN BRANCH; HAV A 4930
 STI YESG1; HAV A 4940
 TRM MESG1 + 93; HEADLINE CHANGE FROM; HAV A 4950
 CAL MESG3 + 13; 0-120 THE TO 0-120 THE; HAV A 4960
 STI MESG1 + 103; HAV A 4970
 CLA UNO; HAV A 4980
 FOP UNO; HAV A 4990
 TRM UNO31; HAV A 5000
 CLA UNO31; HAV A 5010
 STI UNO31; HAV A 5020
 CAL STPLC1; HAV A 5030
 STI STPLC1; HAV A 5040
 TRM UNO31; HAV A 5050
 CLA UNO31; HAV A 5060
 ADD UNO31; HAV A 5070

```

013 01075 0 01 0 00 00572 000 014
013 01076 0 01 0 00 00015 000 014
013 01077 0 01 0 00 00503 000 014
013 01101 0 01 0 00 00572 000 014
013 01102 0 01 0 00 00574 000 014
013 01103 0 01 0 00 02672 000 013
013 01104 0 01 0 00 00000 001 000
013 01105 0 01 0 00 00572 000 014
013 01106 0 01 0 00 00746 000 013
013 01107 0 01 0 00 00457 000 014
013 01110 0 01 0 00 00001 000 000
013 01111 0 01 0 00 01142 000 013
013 01112 0 01 0 00 00001 000 000
013 01113 0 01 0 00 00457 000 014
013 01114 0 01 0 00 00204 000 000
013 01115 0 01 0 00 00573 000 014
013 01116 0 01 0 00 00013 000 014
013 01117 0 01 0 00 00573 000 014
013 01120 0 01 0 00 00574 000 014
013 01121 0 01 0 00 00574 000 014
013 01122 0 01 0 00 02672 000 013
013 01123 0 01 0 00 00120 000 000
013 01124 0 01 0 00 00573 000 014
013 01125 0 01 0 00 00013 000 014
013 01126 0 01 0 00 03074 000 013
013 01127 0 01 0 00 00573 000 014
013 01130 0 01 0 00 00574 000 014
013 01133 0 01 0 00 00574 000 014
013 01132 0 01 0 00 02672 000 013
013 01133 0 01 0 00 00074 000 000
013 01134 0 01 0 00 00573 000 014
013 01135 0 01 0 00 00013 000 014
013 01136 0 01 0 00 00573 000 014
013 01137 0 01 0 00 00574 000 014
013 01140 0 01 0 00 00574 000 014
013 01141 0 01 0 00 02672 000 013
013 01142 0 01 0 00 00001 001 014
013 01143 0 01 0 00 03074 000 013
013 01144 0 01 0 00 01146 000 013
013 01145 0 01 0 00 01164 000 013
013 01146 0 01 0 00 00424 000 014
013 01147 0 01 0 00 00001 000 000
013 01150 0 01 0 00 01160 000 013
013 01151 0 01 0 00 00427 000 014
013 01152 0 01 0 00 00002 000 000
013 01153 0 01 0 00 01160 000 013
013 01154 0 01 0 00 00463 000 014
013 01155 0 01 0 00 00001 000 000
013 01156 0 01 0 00 00463 000 014
013 01157 0 01 0 00 01757 000 013
013 01160 0 01 0 00 00001 000 011
013 01161 0 01 0 00 00374 000 000
013 01162 0 01 0 00 00757 000 013
013 01163 0 01 0 00 00744 000 013
013 01164 0 01 0 00 00463 000 014

```

ST1 001
 SUBMT 001CHPTP2N,00,EN1: PUNCH REMAINING DATA
 HAV A 5070
 HAV A 5100

TEST FOR SUBROUTINE ERROR
 ERROR EXIT
 RESET PTP2N COUNTER
 HAV A 5090
 HAV A 5100
 HAV A 5110
 HAV A 5120
 HAV A 5130
 HAV A 5140
 HAV A 5150
 HAV A 5160
 HAV A 5170
 HAV A 5180
 HAV A 5190
 HAV A 5200
 HAV A 5210

0-120 ZH-SCAN ENTRY
 FIRST TIME THROUGH
 NO
 YES - CHANGE BRANCH
 PUNCH LEADER
 HAV A 5220
 HAV A 5230
 HAV A 5240
 HAV A 5250
 HAV A 5260

SUBMT 001CHPTP2N,00,EN1: PUNCH PAPER TAPE REWINDING
 HAV A 5270
 HAV A 5280
 HAV A 5290
 HAV A 5300
 HAV A 5310

TEST FOR SUBROUTINE ERROR
 ERROR EXIT
 PUNCH LEADER
 HAV A 5320
 HAV A 5330
 HAV A 5340
 HAV A 5350
 HAV A 5360
 HAV A 5370
 HAV A 5380
 HAV A 5390
 HAV A 5400
 HAV A 5410
 HAV A 5420
 HAV A 5430
 HAV A 5440
 HAV A 5450
 HAV A 5460
 HAV A 5470
 HAV A 5480
 HAV A 5490
 HAV A 5500
 HAV A 5510
 HAV A 5520

TEST FOR SUBROUTINE ERROR
 ERROR EXIT
 TEST FOR END OF RAW DATA
 IS THERE RAW DATA LEFT
 DATA TO BE ANALYZED
 END OF 0-120 TWO-MOP & DATA
 IS DATA 0-120 TYPE
 NO
 YES - PROCEED
 IS DATA TWO-MOP & TYPE
 NO
 YES - PROCEED AND SET
 VARIABLE COUNTER
 DATA AVAILABLE
 IS THERE DATA IN TAMP
 YES - LOAD DATA BUFFER
 NO - HEAD IN NEW BLOCK
 HAV A 5530
 HAV A 5540
 HAV A 5550
 HAV A 5560
 HAV A 5570
 HAV A 5580
 HAV A 5590
 HAV A 5600
 HAV A 5610
 HAV A 5620
 HAV A 5630
 HAV A 5640
 HAV A 5650
 HAV A 5660
 HAV A 5670
 HAV A 5680
 HAV A 5690
 HAV A 5700
 HAV A 5710
 HAV A 5720

NAV A 5530
NAV A 5540
NAV A 5550
NAV A 5560
NAV A 5570

NO 0-120 ZME DATA

NO DATA MESSAGE

UNIT 134
TAP 0134
LXP 0134
STP 0134
SUMPT 0134(MESG2,CH,EM):

TEST FOR SUBROUTINE ERROR

ERROR EXIT

SET NEXT SCAN BRANCH

HEADLINE CHANGE FROM

0-120 ZME TO 0-120 IMF

RESET IMPSE TWO

VARIABLE CONNECTIONS

RESET MAG TAPE BLOCK NUMBER

STOP CODE FOR X-Y PLOTTER

UNIT 134

TAP 0134

LXP 0134

STP 0134

SUMPT 0134(MESG2,CH,EM):

TEST FOR SUBROUTINE ERROR

ERROR EXIT

SET NEXT SCAN BRANCH

HEADLINE CHANGE FROM

0-120 ZME TO 0-120 IMF

RESET IMPSE TWO

VARIABLE CONNECTIONS

RESET MAG TAPE BLOCK NUMBER

STOP CODE FOR X-Y PLOTTER

UNIT 134

TAP 0134

LXP 0134

STP 0134

SUMPT 0134(MESG2,CH,EM):

TEST FOR SUBROUTINE ERROR

ERROR EXIT

SET NEXT SCAN BRANCH

HEADLINE CHANGE FROM

0-120 ZME TO 0-120 IMF

RESET IMPSE TWO

VARIABLE CONNECTIONS

RESET MAG TAPE BLOCK NUMBER

STOP CODE FOR X-Y PLOTTER

UNIT 134

TAP 0134

LXP 0134

STP 0134

SUMPT 0134(MESG2,CH,EM):

TEST FOR SUBROUTINE ERROR

ERROR EXIT

SET NEXT SCAN BRANCH

HEADLINE CHANGE FROM

0-120 ZME TO 0-120 IMF

RESET IMPSE TWO

VARIABLE CONNECTIONS

RESET MAG TAPE BLOCK NUMBER

STOP CODE FOR X-Y PLOTTER

UNIT 134

TAP 0134

LXP 0134

STP 0134

SUMPT 0134(MESG2,CH,EM):

013 01167 0 00 0 00 00002 000 000
013 01166 0 00 0 00 01177 000 013
013 01167 0 00 0 00 00210 000 000
013 01170 0 00 0 00 00573 000 014
013 01171 0 00 0 00 00015 000 004
013 01172 0 00 0 00 03120 000 013
013 01173 0 00 0 00 00573 000 014
013 01174 0 00 0 00 00574 000 014
013 01175 0 00 0 00 00574 000 014
013 01176 0 00 0 00 02672 000 013
013 01177 0 00 0 00 00001 001 000
013 01200 0 00 0 00 03164 000 013
013 01201 0 00 0 00 03115 000 013
013 01202 0 00 0 00 03155 000 013
013 01203 0 00 0 00 03106 000 013
013 01204 0 00 0 00 03146 000 013
013 01205 0 00 0 00 03110 000 013
013 01206 0 00 0 00 03167 000 013
013 01207 0 00 0 00 03211 000 013
013 01210 0 00 0 00 00001 000 000
013 01211 0 00 0 00 00444 000 014
013 01212 0 00 0 00 00465 000 014
013 01213 0 00 0 00 00012 000 000
013 01214 0 00 0 00 00446 000 014
013 01215 0 00 0 00 03072 000 013
013 01216 0 00 0 00 03503 001 014
013 01217 0 00 0 00 00572 000 014
013 01220 0 00 0 00 00004 000 000
013 01221 0 00 0 00 00572 000 014
013 01222 0 00 0 00 00015 000 014
013 01223 0 00 0 00 00573 000 014
013 01224 0 00 0 00 00572 000 014
013 01225 0 00 0 00 00574 000 014
013 01226 0 00 0 00 00574 000 014
013 01227 0 00 0 00 02672 000 013
013 01230 0 00 0 00 00000 001 000
013 01231 0 00 0 00 00572 000 014
013 01232 0 00 0 00 00746 000 013
013 01233 0 00 0 00 00460 000 014
013 01234 0 00 0 00 00001 000 000
013 01235 0 00 0 00 01266 000 013
013 01236 0 00 0 00 00001 000 000
013 01237 0 00 0 00 00460 000 014
013 01240 0 00 0 00 01264 000 000
013 01241 0 00 0 00 00573 000 014
013 01242 0 00 0 00 00015 000 004
013 01243 0 00 0 00 00573 000 014
013 01244 0 00 0 00 00574 000 014
013 01245 0 00 0 00 00574 000 014
013 01246 0 00 0 00 02672 000 013
013 01247 0 00 0 00 00120 000 000
013 01250 0 00 0 00 00573 000 014
013 01251 0 00 0 00 00015 000 004
013 01252 0 00 0 00 00374 000 013
013 01253 0 00 0 00 00573 000 014
013 01254 0 00 0 00 00574 000 014

NAV A 5530
NAV A 5540
NAV A 5550
NAV A 5560
NAV A 5570

TEST FOR SUBROUTINE ERROR

ERROR EXIT

RESET PTPZN COUNTER

0-120 IMF SCAN ENTRY

FIRST LINE THROUGH

NO

YES - CHANGE BRANCH

PUNCH LEADER

TEST FOR SUBROUTINE ERROR

ERROR EXIT

PUNCH PAPER TAPE HEADLINE

NAV A 5530
NAV A 5540
NAV A 5550
NAV A 5560
NAV A 5570

```

013 01255 0 F0P 2 00 00574 000 014
013 01256 0 TMM 0 10 02672 000 013
013 01257 0 CLA 0 00 00074 000 000
013 01260 0 STL 0 00 00573 000 014
013 01261 0 TMM 1 00 00013 000 014
013 01262 0 CLA 0 00 00573 000 014
013 01263 0 CLA 0 00 00574 000 014
013 01264 0 F0P 2 00 00574 000 014
013 01265 0 TMM 0 10 02672 000 013
013 01266 0 CLA 2 01 00001 001 014
013 01267 0 TMM 2 00 03071 000 013
013 01270 0 TMM 0 10 01272 000 013
013 01271 0 TMM 0 00 01310 000 013
013 01272 0 CLA 2 00 00424 000 014
013 01273 0 F0P 0 00 00001 000 000
013 01274 0 TMM 0 10 01304 000 013
013 01275 0 CLA 2 00 00427 000 014
013 01276 0 F0P 0 00 00003 000 000
013 01277 0 TMM 0 00 01304 000 013
013 01300 0 CLA 2 00 00465 000 014
013 01301 0 F0P 0 00 00001 000 000
013 01302 0 STL 0 00 00465 000 014
013 01303 0 TMM 0 00 01757 000 013
013 01304 0 CLA 2 00 00001 000 001
013 01305 0 F0P 0 00 00574 000 000
013 01306 0 TMM 0 00 00757 000 013
013 01307 0 TMM 0 00 00746 000 013
013 01310 0 CLA 2 00 00465 000 014
013 01311 0 F0P 0 00 00001 000 000
013 01312 0 TMM 0 00 01323 000 013
013 01313 0 CLA 0 00 00210 000 000
013 01314 0 STL 0 00 00573 000 014
013 01315 0 TMM 1 00 00015 000 004
013 01316 0 CLA 0 00 03120 000 013
013 01317 0 CLA 0 00 00573 000 014
013 01320 0 CLA 0 00 00574 000 014
013 01321 0 F0P 2 00 00574 000 014
013 01322 0 TMM 0 00 02672 000 013
013 01323 0 ADP 0 05 00001 001 000
013 01324 0 CAL 2 00 03170 000 013
013 01325 0 STL 0 00 03073 000 013
013 01326 0 CAL 2 00 03171 000 013
013 01327 0 STL 0 00 03076 000 013
013 01330 0 CAL 2 00 03172 000 013
013 01331 0 STL 0 00 03077 000 013
013 01332 0 CAL 2 00 03173 000 013
013 01333 0 STL 0 00 03100 000 013
013 01334 0 CAL 2 00 03174 000 013
013 01335 0 STL 0 00 03105 000 013
013 01336 0 CAL 2 00 03175 000 013
013 01337 0 STL 0 00 03176 000 013
013 01338 0 CAL 2 00 03176 000 013
013 01339 0 STL 0 00 03170 000 013
013 01340 0 CAL 2 00 03177 000 013
013 01341 0 STL 0 00 03111 000 013
013 01344 0 CLA 0 00 00001 000 000

TEST FOR SUBROUTINE ERRORS
ERRORS EXIT
PUNCH LEADER

TEST FOR SUBROUTINE ERRORS
ERRORS EXIT
IS THERE DATA IN TEMP
YES - PROCEED
IS DATA ONE-MOP TYPE
NO
YES - PROCEED AND SET
VARIABLE CONNECTION
DATA AVAILABLE
IS THERE DATA IN TEMP
YES - LOAD DATA BUFFER
NO - READ IN NEW BLOCK
END 0120 IMP DATA
END 0120 IMP DATA
NO DATA MESSAGE

TEST FOR SUBROUTINE ERRORS
ERRORS EXIT
SET NEXT SCAN BRANCH

TESTING CHANGE FROM
0-120 IMP TO 0-240 IMP

```


ADD	UNIT	DATA	DESCRIPTION	ADDRESS
0000	0000	0000	0000	0000
0001	0001	0001	0001	0001
0002	0002	0002	0002	0002
0003	0003	0003	0003	0003
0004	0004	0004	0004	0004
0005	0005	0005	0005	0005
0006	0006	0006	0006	0006
0007	0007	0007	0007	0007
0008	0008	0008	0008	0008
0009	0009	0009	0009	0009
0010	0010	0010	0010	0010
0011	0011	0011	0011	0011
0012	0012	0012	0012	0012
0013	0013	0013	0013	0013
0014	0014	0014	0014	0014
0015	0015	0015	0015	0015
0016	0016	0016	0016	0016
0017	0017	0017	0017	0017
0018	0018	0018	0018	0018
0019	0019	0019	0019	0019
0020	0020	0020	0020	0020
0021	0021	0021	0021	0021
0022	0022	0022	0022	0022
0023	0023	0023	0023	0023
0024	0024	0024	0024	0024
0025	0025	0025	0025	0025
0026	0026	0026	0026	0026
0027	0027	0027	0027	0027
0028	0028	0028	0028	0028
0029	0029	0029	0029	0029
0030	0030	0030	0030	0030
0031	0031	0031	0031	0031
0032	0032	0032	0032	0032
0033	0033	0033	0033	0033
0034	0034	0034	0034	0034
0035	0035	0035	0035	0035
0036	0036	0036	0036	0036
0037	0037	0037	0037	0037
0038	0038	0038	0038	0038
0039	0039	0039	0039	0039
0040	0040	0040	0040	0040
0041	0041	0041	0041	0041
0042	0042	0042	0042	0042
0043	0043	0043	0043	0043
0044	0044	0044	0044	0044
0045	0045	0045	0045	0045
0046	0046	0046	0046	0046
0047	0047	0047	0047	0047
0048	0048	0048	0048	0048
0049	0049	0049	0049	0049
0050	0050	0050	0050	0050
0051	0051	0051	0051	0051
0052	0052	0052	0052	0052
0053	0053	0053	0053	0053
0054	0054	0054	0054	0054
0055	0055	0055	0055	0055
0056	0056	0056	0056	0056
0057	0057	0057	0057	0057
0058	0058	0058	0058	0058
0059	0059	0059	0059	0059
0060	0060	0060	0060	0060
0061	0061	0061	0061	0061
0062	0062	0062	0062	0062
0063	0063	0063	0063	0063
0064	0064	0064	0064	0064
0065	0065	0065	0065	0065
0066	0066	0066	0066	0066
0067	0067	0067	0067	0067
0068	0068	0068	0068	0068
0069	0069	0069	0069	0069
0070	0070	0070	0070	007


```

015 02150 0 000 2 00 00003 000 014
015 02150 0 000 2 00 00002 000 000
015 02150 0 000 2 00 02167 000 013
015 02157 0 000 2 00 02077 000 013
015 02160 0 000 2 00 00003 000 014
015 02161 0 000 2 00 00002 000 000
015 02162 0 000 2 00 00003 000 014
015 02163 0 000 2 00 00004 000 014
015 02164 0 000 2 00 00002 000 000
015 02165 0 000 2 00 00004 000 014
015 02166 0 000 2 00 02141 000 013
015 02167 0 000 2 00 00003 000 014
015 02170 0 000 2 00 00004 000 014
015 02171 0 000 2 00 00003 000 014
015 02172 0 000 2 00 00002 000 014
015 02173 0 000 2 00 00002 000 000
015 02174 0 000 2 00 00002 000 000
015 02175 0 000 2 00 00002 000 014
015 02176 0 000 2 00 00002 000 014
015 02177 0 000 2 00 00002 000 014
015 02200 0 000 2 00 00002 000 014
015 02201 0 000 2 00 00002 000 013
015 02202 0 000 2 00 00002 000 004
015 02203 0 000 2 00 00002 000 014
015 02204 0 000 2 00 00002 000 014
015 02205 0 000 2 00 00002 000 014
015 02206 0 000 2 00 00002 000 014
015 02207 0 000 2 00 00002 000 014
015 02210 0 000 2 00 00002 000 014
015 02211 0 000 2 00 00002 000 014
015 02212 0 000 2 00 00002 000 014
015 02213 0 000 2 00 00002 000 014
015 02214 0 000 2 00 00002 000 014
015 02215 0 000 2 00 00002 000 014
015 02216 0 000 2 00 00002 000 014
015 02217 0 000 2 00 00002 000 014
015 02218 0 000 2 00 00002 000 014
015 02219 0 000 2 00 00002 000 014
015 02220 0 000 2 00 00002 000 014
015 02221 0 000 2 00 00002 000 014
015 02222 0 000 2 00 00002 000 014
015 02223 0 000 2 00 00002 000 013
015 02224 0 000 2 00 00002 000 000
015 02225 0 000 2 00 00002 000 014
015 02226 0 000 2 00 00002 000 013
015 02227 0 000 2 00 00002 000 000
015 02228 0 000 2 00 00002 000 014
015 02229 0 000 2 00 00002 000 000
015 02230 0 000 2 00 00002 000 014
015 02231 0 000 2 00 00002 000 014
015 02232 0 000 2 00 00002 000 014
015 02233 0 000 2 00 00002 000 014
015 02234 0 000 2 00 00002 000 014
015 02235 0 000 2 00 00002 000 014
015 02236 0 000 2 00 00002 000 014
015 02237 0 000 2 00 00002 000 014
015 02238 0 000 2 00 00002 000 014
015 02239 0 000 2 00 00002 000 014
015 02240 0 000 2 00 00002 000 014
015 02241 0 000 2 00 00002 000 014
015 02242 0 000 2 00 00002 000 014

```

NO DATA THIS GRAPH MESSAGE
 INCREMENT ONE HOUR REFERENCE
 INCREMENT EVEN HOUR REFERENCE
 GO BACK AND TRY AGAIN
 PLOTTER X COMPONENT
 NORMALIZED RANGE ERROR
 RANGE ERROR SCALE FACTOR
 PLOTTER Y COMPONENT
 TIME SCALE FACTOR
 TARGET PLOT ENTRY
 POLAR TO CARTESIAN COORDINATES
 PLOTTER Y COMPONENT
 POLAR TO CARTESIAN COORDINATES
 PLOTTER X COMPONENT
 NORMALIZE X
 TARGET PLOT SCALE FACTOR
 NORMALIZE Y
 TARGET PLOT SCALE FACTOR
 SIGN TEST
 POSITIVE X
 NEGATIVE X
 ABSOLUTIZES X
 THOUSANDS INTEGER
 THOUSANDS INTEGER

PAY A 9480
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 PAY A 380
 PAY A 390
 PAY A 400

POINT A LATITUDE	POINT A LONGITUDE	POINT A ELEVATION	POINT B LATITUDE	POINT B LONGITUDE	POINT B ELEVATION	POINT C LATITUDE	POINT C LONGITUDE	POINT C ELEVATION	POINT D LATITUDE	POINT D LONGITUDE	POINT D ELEVATION	POINT E LATITUDE	POINT E LONGITUDE	POINT E ELEVATION	POINT F LATITUDE	POINT F LONGITUDE	POINT F ELEVATION	POINT G LATITUDE	POINT G LONGITUDE	POINT G ELEVATION	POINT H LATITUDE	POINT H LONGITUDE	POINT H ELEVATION	POINT I LATITUDE	POINT I LONGITUDE	POINT I ELEVATION	POINT J LATITUDE	POINT J LONGITUDE	POINT J ELEVATION	POINT K LATITUDE	POINT K LONGITUDE	POINT K ELEVATION	POINT L LATITUDE	POINT L LONGITUDE	POINT L ELEVATION	POINT M LATITUDE	POINT M LONGITUDE	POINT M ELEVATION	POINT N LATITUDE	POINT N LONGITUDE	POINT N ELEVATION	POINT O LATITUDE	POINT O LONGITUDE	POINT O ELEVATION	POINT P LATITUDE	POINT P LONGITUDE	POINT P ELEVATION	POINT Q LATITUDE	POINT Q LONGITUDE	POINT Q ELEVATION	POINT R LATITUDE	POINT R LONGITUDE	POINT R ELEVATION	POINT S LATITUDE	POINT S LONGITUDE	POINT S ELEVATION	POINT T LATITUDE	POINT T LONGITUDE	POINT T ELEVATION	POINT U LATITUDE	POINT U LONGITUDE	POINT U ELEVATION	POINT V LATITUDE	POINT V LONGITUDE	POINT V ELEVATION	POINT W LATITUDE	POINT W LONGITUDE	POINT W ELEVATION	POINT X LATITUDE	POINT X LONGITUDE	POINT X ELEVATION	POINT Y LATITUDE	POINT Y LONGITUDE	POINT Y ELEVATION	POINT Z LATITUDE	POINT Z LONGITUDE	POINT Z ELEVATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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MAY 4 3000

MAY 6 3010

012.21

LNLSU 1 ISI AVEILS 1,MMSS 1,NOVILS 13

LNPMU 10MMI 1/30M OVERALL AVERAGE: TOTAL AVERAGE = 0.10.21M MAY 4 3020

MAY 4 3030

POINTS AVERAGE = 0.10.2 / 4MM

MAY 4 3040

TOTAL NUMBER OF POINTS = 0.10.2

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LNPM FORM 17M TRANSLATION ERRORS

NAV B 3650

LNPM FORM 11M END OF JOB

NAV B 3660

LNST (1ST) ADDRESS 1, 2, 3, 4

NAV B 3670

LNPM FORM 14 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3680

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3690

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3700

NAV B 3710

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3720

NAV B 3730

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3740

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3750

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3760

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3770

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3780

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3790

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3800

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3810

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3820

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3830

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3840

LNPM FORM 18 102M PAPER TAPE PUNCH STATION ERROR / 25M ADDRESS UP NAV B 3850

LNPM	002	00001	CHBAU	002	00006	MAG	005	00003	TEMP	014	00001	STOP	014	00401	SKIP	014	00402	LNCH1	014	00403
LNQ42	014	00404	LNCH3	014	00407	LATM1	014	00411	LATM2	014	00413	LATM3	014	00415	REFM	014	00417	OLUM	014	00420
PLOT	014	00421	ALPM	014	00422	TIME	014	00423	AM1	014	00424	PM	014	00425	RE	014	00426	MOP	014	00427
DATA	014	00430	LNQY1	014	00431	LNQY2	014	00432	LNQY3	014	00433	LATY1	014	00437	LATY2	014	00441	LATY3	014	00443
MFTM	014	00447	MRK	014	00448	RMSTL	014	00447	AVEL	014	00450	NUMTL	014	00451	ADRES	014	00452	NUM10	014	00453
NUM20	014	00454	NUM30	014	00455	HRN1	014	00456	HRN2	014	00457	HRN3	014	00460	HRN4	014	00461	HRN5	014	00462
HRN6	014	00463	HRN7	014	00464	HRN8	014	00465	HRN9	014	00466	UP22	014	00467	IM	014	00470	DISI	014	00471
IC51	014	00472	IC52	014	00473	IC53	014	00474	SUM10	014	00475	SUM20	014	00476	SUM30	014	00477	AVP10	014	00500
AVP20	014	00501	AVE30	014	00502	PTP2N	014	00503	SUMEM	014	00504	MEAN	014	00570	TDIFF	014	00571	WD	014	00572
CM	014	00573	EM	014	00574	VT	014	00575	FM	014	00576	X1	014	00577	VI	014	00578	ACCUM	014	00601
ABC	014	00602	DDUTH	014	00603	EVN14	014	00604	DD1F1	014	00605	EVU14	014	00606	BUFFM	014	00607	DIFIL	014	00627
MAS	014	00630	DDMMY	002	00601	DTLNA	002	00602	PIE	013	03061	FMOP1	013	03063	MAD	013	03062	MUS	013	03067
FLKNO	013	03071	STPCU	013	03072	SHFIL	013	03073	MESG1	013	03074	MESG2	013	03120	MESG3	013	03162	MESG4	013	03164
MESG5	013	03171	MESG6	013	03203	MESG7	013	03204	IPAAP	013	00001	CNT1	013	00100	CNT2	013	00104	CNT3	013	00105
CNT4	013	00221	CNT5	013	00220	CNT6	013	00276	CNT7	013	00307	CNT8	013	00316	CNT9	013	00323	CNT10	013	00324
CNT12	013	00377	CNT10	013	00402	CNT14	013	00407	CNT15	013	00437	CNT16	013	00462	CNT17	013	00506	CNT18	013	00532
CNT19	013	00570	CNT19	013	00577	CNT20	013	00603	CNT21	013	00667	CNTC	013	00677	CNT22	013	00740	CNT23	013	00757
CNT24	013	00767	CNT30	013	01022	CNT32	013	01027	CNT25	013	01107	CNT33	013	01142	CNT34	013	01177	CNT35	013	01233
CNT39	013	01266	CNT36	013	01320	CNT27	013	01307	CNT37	013	01422	CNT38	013	01427	CNT39	013	01507	CNT40	013	01542
CNT40	013	01577	CNT29	013	01633	CNT41	013	01666	CNT42	013	01723	CNT51	013	01757	CNT44	013	01772	CNT45	013	02010
CNT45	013	02044	CNT49	013	02077	CNT46	013	02113	CNT50	013	02132	CNT47	013	02137	CNT48	013	02141	CNT51	013	02167
CNT46	013	02202	CNT55	013	02222	CNTD	013	02334	CNT54	013	02403	EX17	013	02412	CNT41	013	02443	HPF10	013	02525
AL30R	013	02534	IRANA	013	02563	QUA01	013	02630	QUA02	013	02634	QUA03	013	02643	QUA04	013	02649	IR16	013	02657
ERROR	013	02672	LPLSA	013	02714	LNPM1	013	03257	LPLSB	013	02727	LNPM2	013	03263	LNPM3	013	03301	LNLS4	013	02752
LNPM1	013	03437	LNPM2	013	03464	LNLSM	013	02755	LPLSM	013	03622	LNLS1	013	02796	LNPM1	013	03661	LNLS2	013	02771
LNPM3	013	03707	LNLSK	013	03000	LNPM4	013	03711	LPLML	013	03761	LNPM5	013	04067	LNPM6	013	04075	LNPM7	013	04123
LNLSP	013	03721	LPLMP	013	04163	LNLSU	013	03944	LPLMU	013	04203	LNPM8	013	04251	LNPM9	013	04257	LNLS1	013	03953
LNPM1	013	04263	LNPM2	013	04313															

PROGRAM INDEX TABLE

LN1	001	001	013	IM2	001	002	013	IM3	001	003	013	IM4	001	004	013	IM5	001	005	013
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WORD IN PROGRAM	14726	LOCATIONS USED BY PROGRAM (EXCLUSIVE OF COMMON STORAGE)	14701
COMMON INDX BASE	00014	LOGICAL EQUIPMENT TABLE BASE	02520
FORMAT BASE	NONE	INPUT/OUTPUT LIST AREA BASE	NONE
COMMON STORAGE BASE	17752	PROGRAM TRANSFER VECTOR BASE	02524
PROCEDURE COMMAND BASE	1P44P 02563	RESERVE STORAGE BASE	07101
SUBROUTINE COMMAND BASE	PH12P 12142	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00017 12511	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00021 13115	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00026 13118	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00025 13117	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00027 13116	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00028 13119	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00029 13120	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00030 13121	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00031 13122	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00032 13123	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00033 13124	RESERVE STORAGE BASE	NONE
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SUBROUTINE COMMAND BASE	00036 13127	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00037 13128	RESERVE STORAGE BASE	NONE
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SUBROUTINE COMMAND BASE	00044 13135	RESERVE STORAGE BASE	NONE
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SUBROUTINE COMMAND BASE	00273 13364	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00274 13365	RESERVE STORAGE BASE	NONE
SUBROUTINE COMMAND BASE	00		

SUPROUTINE 00051 MSTR
COMMAND BASE 15721

NONE

RESERVE STORAGE BASF

INITIAL PROGRAM ENTRY POINT 02564

Comment: The following printout is part of an actual data run and this coincides with the complete Range Error vs. Time and Target Plots included in the figures (See Figures 3a and 6).

THIS PRINTOUT OF THE JOURNAL PREDICTION ANALYZER AND PLOTTER PROGRAM RESULTS CONTAINS THE FOLLOWING INFORMATION:

NOTE: ANTENNA PAIR # 1 DENOTES U-120 ANTENNA
 ANTENNA PAIR # 2 DENOTES U-240 ANTENNA
 PROPAGATION MODE # 1 DENOTES LINE-HOP F
 PROPAGATION MODE # 2 DENOTES LINE-HOP F
 PROPAGATION MODE # 3 DENOTES LINE-HOP F

RUNNING AVERAGES FOR LINE # 24 HOURS RANGE M.H.I. KNOWN LOCATION AVERAGES									
30-MINUTE RUNNING AVERAGES					20-MINUTE RUNNING AVERAGES				
AVERAGE	TIME	POINTS	AVERAGE	TIME	POINTS	AVERAGE	TIME	POINTS	AVERAGE
20.405	1.084	1.00	20.405	1.084	1.00	20.405	1.084	1.00	20.405
20.592	1.096	2.00	20.592	1.096	2.00	20.592	1.096	2.00	20.592
27.004	1.103	3.00	27.004	1.103	3.00	27.004	1.103	3.00	27.004
21.105	1.111	4.00	21.105	1.111	4.00	21.105	1.111	4.00	21.105
18.074	1.123	5.00	18.074	1.123	5.00	18.074	1.123	5.00	18.074
20.412	1.127	6.00	20.412	1.127	6.00	20.412	1.127	6.00	20.412
19.285	1.134	7.00	19.285	1.134	7.00	19.285	1.134	7.00	19.285
20.054	1.153	8.00	20.054	1.153	8.00	20.054	1.153	8.00	20.054
22.317	1.157	9.00	22.317	1.157	9.00	22.317	1.157	9.00	22.317
20.062	1.160	10.00	20.062	1.160	10.00	20.062	1.160	10.00	20.062
21.539	1.165	11.00	21.539	1.165	11.00	21.539	1.165	11.00	21.539
20.212	1.169	12.00	20.212	1.169	12.00	20.212	1.169	12.00	20.212
21.006	1.176	13.00	21.006	1.176	13.00	21.006	1.176	13.00	21.006
21.346	1.181	14.00	21.346	1.181	14.00	21.346	1.181	14.00	21.346
23.268	1.186	15.00	23.268	1.186	15.00	23.268	1.186	15.00	23.268
22.568	1.216	16.00	22.568	1.216	16.00	22.568	1.216	16.00	22.568
22.715	1.230	17.00	22.715	1.230	17.00	22.715	1.230	17.00	22.715
23.963	1.236	18.00	23.963	1.236	18.00	23.963	1.236	18.00	23.963
22.869	1.242	19.00	22.869	1.242	19.00	22.869	1.242	19.00	22.869
23.746	1.247	20.00	23.746	1.247	20.00	23.746	1.247	20.00	23.746
23.637	1.251	21.00	23.637	1.251	21.00	23.637	1.251	21.00	23.637
23.043	1.274	22.00	23.043	1.274	22.00	23.043	1.274	22.00	23.043
23.311	1.286	23.00	23.311	1.286	23.00	23.311	1.286	23.00	23.311
24.052	1.291	24.00	24.052	1.291	24.00	24.052	1.291	24.00	24.052
24.246	1.295	25.00	24.246	1.295	25.00	24.246	1.295	25.00	24.246
24.520	1.322	26.00	24.520	1.322	26.00	24.520	1.322	26.00	24.520
24.353	1.330	27.00	24.353	1.330	27.00	24.353	1.330	27.00	24.353
23.729	1.359	1.00	23.729	1.359	1.00	23.729	1.359	1.00	23.729
23.775	1.364	2.00	23.775	1.364	2.00	23.775	1.364	2.00	23.775
23.987	1.367	3.00	23.987	1.367	3.00	23.987	1.367	3.00	23.987
24.164	1.374	4.00	24.164	1.374	4.00	24.164	1.374	4.00	24.164
24.367	1.382	5.00	24.367	1.382	5.00	24.367	1.382	5.00	24.367
24.684	1.386	6.00	24.684	1.386	6.00	24.684	1.386	6.00	24.684
24.659	1.389	7.00	24.659	1.389	7.00	24.659	1.389	7.00	24.659
25.162	1.392	8.00	25.162	1.392	8.00	25.162	1.392	8.00	25.162
25.020	1.399	9.00	25.020	1.399	9.00	25.020	1.399	9.00	25.020
25.020	1.406	10.00	25.020	1.406	10.00	25.020	1.406	10.00	25.020
25.264	1.431	11.00	25.264	1.431	11.00	25.264	1.431	11.00	25.264
25.666	1.441	12.00	25.666	1.441	12.00	25.666	1.441	12.00	25.666

20.14	1.445	13.00	20.54	1.445	13.00	25.651	1.445	40.00
27.44	1.445	14.00	27.044	1.449	14.00	25.545	1.449	41.00
29.14	1.454	15.00	27.119	1.454	15.00	26.020	1.454	42.00
20.47	1.465	16.00	24.478	1.465	16.00	25.408	1.465	43.00
20.23	1.557	1.00	27.945	1.557	17.00	20.236	1.557	1.00
30.11	1.560	2.00	27.060	1.560	18.00	30.114	1.560	2.00
30.07	1.565	3.00	27.730	1.565	19.00	30.074	1.565	3.00
25.44	1.546	4.00	27.010	1.546	20.00	25.442	1.546	4.00
1.602	1.602	5.00	27.142	1.602	21.00	27.142	1.602	5.00
24.24	1.606	6.00	27.337	1.606	22.00	24.246	1.606	6.00
25.40	1.612	7.00	27.063	1.612	23.00	25.401	1.612	7.00
27.40	1.616	8.00	27.214	1.616	24.00	27.406	1.616	8.00
20.14	1.623	9.00	27.708	1.623	25.00	20.140	1.623	9.00
25.41	1.631	10.00	27.257	1.631	26.00	25.410	1.631	10.00
23.44	1.636	11.00	26.717	1.636	27.00	23.440	1.636	11.00
22.97	1.653	12.00	26.120	1.653	28.00	22.977	1.653	12.00
23.52	1.658	13.00	27.256	1.658	29.00	23.522	1.658	13.00
22.05	1.663	14.00	27.461	1.663	30.00	22.057	1.663	14.00
5.14	1.664	1.00	27.141	1.664	1.00	5.140	1.664	1.00
12.44	1.684	2.00	12.030	1.684	2.00	12.440	1.684	2.00
14.44	1.690	3.00	14.440	1.690	3.00	14.440	1.690	3.00
14.00	1.700	4.00	14.000	1.700	4.00	14.000	1.700	4.00
24.34	1.706	5.00	24.340	1.706	5.00	24.340	1.706	5.00
25.44	1.712	6.00	25.440	1.712	6.00	25.440	1.712	6.00
20.14	1.717	7.00	20.140	1.717	7.00	20.140	1.717	7.00
20.44	1.722	8.00	20.440	1.722	8.00	20.440	1.722	8.00
20.40	1.728	9.00	20.400	1.728	9.00	20.400	1.728	9.00
25.04	1.734	10.00	25.040	1.734	10.00	25.040	1.734	10.00
25.43	1.741	11.00	25.430	1.741	11.00	25.430	1.741	11.00
20.43	1.747	12.00	20.430	1.747	12.00	20.430	1.747	12.00
25.01	1.761	13.00	25.010	1.761	13.00	25.010	1.761	13.00
24.24	1.768	14.00	24.240	1.768	14.00	24.240	1.768	14.00
22.42	1.773	15.00	22.420	1.773	15.00	22.420	1.773	15.00
23.27	1.782	16.00	23.270	1.782	16.00	23.270	1.782	16.00
24.27	1.800	17.00	24.270	1.800	17.00	24.270	1.800	17.00
25.70	1.806	18.00	25.700	1.806	18.00	25.700	1.806	18.00
11.47	1.836	1.00	11.470	1.836	19.00	11.470	1.836	19.00
25.24	1.846	2.00	25.240	1.846	20.00	25.240	1.846	20.00
20.00	1.875	3.00	20.000	1.875	21.00	20.000	1.875	21.00
20.34	1.884	4.00	20.340	1.884	22.00	20.340	1.884	22.00
20.74	1.892	5.00	20.740	1.892	23.00	20.740	1.892	23.00
20.74	1.900	6.00	20.740	1.900	24.00	20.740	1.900	24.00
25.14	1.914	7.00	25.140	1.914	25.00	25.140	1.914	25.00
25.44	1.920	8.00	25.440	1.920	26.00	25.440	1.920	26.00
20.74	1.930	9.00	20.740	1.930	27.00	20.740	1.930	27.00
20.04	1.936	10.00	20.040	1.936	28.00	20.040	1.936	28.00
23.44	1.947	11.00	23.440	1.947	29.00	23.440	1.947	29.00
23.44	1.954	12.00	23.440	1.954	30.00	23.440	1.954	30.00
23.07	1.971	13.00	23.070	1.971	31.00	23.070	1.971	31.00
23.44	1.976	14.00	23.440	1.976	32.00	23.440	1.976	32.00
22.57	1.980	15.00	22.570	1.980	33.00	22.570	1.980	33.00
21.57	1.986	16.00	21.570	1.986	34.00	21.570	1.986	34.00
21.47	1.986	17.00	21.470	1.986	35.00	21.470	1.986	35.00

15.000	3.928	5.00	24.956	3.928	14.00	24.474	3.928	14.00
21.777	4.032	1.00	21.776	4.032	1.00	21.776	4.032	1.00
24.795	4.041	2.00	24.793	4.041	2.00	24.793	4.041	2.00
24.877	4.071	3.00	24.872	4.071	3.00	24.872	4.071	3.00
25.517	4.079	4.00	25.516	4.079	4.00	25.516	4.079	4.00
24.812	4.088	5.00	24.812	4.088	5.00	24.812	4.088	5.00
25.013	4.104	6.00	25.011	4.104	6.00	25.011	4.104	6.00
31.508	4.122	7.00	31.508	4.122	7.00	31.508	4.122	7.00
33.350	4.140	8.00	33.353	4.140	8.00	33.353	4.140	8.00
30.754	4.156	9.00	30.754	4.156	9.00	30.754	4.156	9.00
30.845	4.352	1.00	30.845	4.352	1.00	30.772	4.352	1.00
24.375	4.371	2.00	24.373	4.371	2.00	24.373	4.371	2.00
33.405	4.401	3.00	33.405	4.401	3.00	31.440	4.401	3.00
34.724	4.416	4.00	34.764	4.416	4.00	33.223	4.416	4.00
30.704	4.424	5.00	30.734	4.424	5.00	33.607	4.424	5.00
37.033	4.450	6.00	37.055	4.450	6.00	33.277	4.450	6.00
30.515	4.462	7.00	30.503	4.462	7.00	34.147	4.462	7.00
1.237	4.500	1.00	34.564	4.500	8.00	7.237	4.500	1.00
17.620	4.522	2.00	33.842	4.522	9.00	17.546	4.522	2.00
14.374	4.535	3.00	37.484	4.535	10.00	18.373	4.535	3.00
14.850	4.566	4.00	31.354	4.566	11.00	18.450	4.566	4.00
10.041	4.590	5.00	24.960	4.590	12.00	14.041	4.590	5.00
20.052	4.708	1.00	27.902	4.708	1.00	14.903	4.708	6.00
27.677	4.712	2.00	27.577	4.712	2.00	20.041	4.712	7.00

OVERALL AVERAGES: TOTAL AVERAGE = 25.99 RMS AVERAGE = 14.51
TOTAL NUMBER OF POINTS = 271.00

THIS PROGRAM IS THE THERMAL PREDICTION ANALYZER - A PLOTTER PROGRAM RESULTS CONTAINS THE FOLLOWING INFORMATION:

UNIT: UNIFORM PAIR # 1 DEBITES 0-120 - TENNA
 UNIFORM PAIR # 2 DEBITES 0-24 - TENNA
 PROPAGATION CODE # 1 DEBITES 1-20000
 PROPAGATION CODE # 2 DEBITES 1-20000
 PROPAGATION CODE # 3 DEBITES 1-20000

10-MINUTE AVERAGES FOR TIME 1 24 HOURS RANGE ERROR AVERAGES									
10-MINUTE AVERAGES					30-MINUTE AVERAGES				
AVERAGE	TIME	POINTS	AVERAGE	TIME	AVERAGE	TIME	POINTS	AVERAGE	POINTS
-20.000	1.004	1.000	-20.000	1.004	-20.000	1.004	1.000	-20.000	1.000
-20.000	1.006	2.000	-20.000	1.006	-20.000	1.006	2.000	-20.000	2.000
0.000	1.008	3.000	0.000	1.008	0.000	1.008	3.000	0.000	3.000
0.000	1.011	4.000	0.000	1.011	0.000	1.011	4.000	0.000	4.000
2.000	1.013	5.000	2.000	1.013	2.000	1.013	5.000	2.000	5.000
6.000	1.017	6.000	6.000	1.017	6.000	1.017	6.000	6.000	6.000
4.200	1.019	7.000	4.200	1.019	4.200	1.019	7.000	4.200	7.000
0.625	1.023	8.000	0.625	1.023	0.625	1.023	8.000	0.625	8.000
5.000	1.027	9.000	5.000	1.027	5.000	1.027	9.000	5.000	9.000
4.500	1.030	10.000	4.500	1.030	4.500	1.030	10.000	4.500	10.000
6.000	1.035	11.000	6.000	1.035	6.000	1.035	11.000	6.000	11.000
0.000	1.039	12.000	0.000	1.039	0.000	1.039	12.000	0.000	12.000
14.000	1.043	13.000	14.000	1.043	14.000	1.043	13.000	14.000	13.000
20.000	1.047	14.000	20.000	1.047	20.000	1.047	14.000	20.000	14.000
20.000	1.051	15.000	20.000	1.051	20.000	1.051	15.000	20.000	15.000
20.000	1.055	16.000	20.000	1.055	20.000	1.055	16.000	20.000	16.000
20.000	1.059	17.000	20.000	1.059	20.000	1.059	17.000	20.000	17.000
20.000	1.063	18.000	20.000	1.063	20.000	1.063	18.000	20.000	18.000
20.000	1.067	19.000	20.000	1.067	20.000	1.067	19.000	20.000	19.000
20.000	1.071	20.000	20.000	1.071	20.000	1.071	20.000	20.000	20.000
20.000	1.075	21.000	20.000	1.075	20.000	1.075	21.000	20.000	21.000
20.000	1.079	22.000	20.000	1.079	20.000	1.079	22.000	20.000	22.000
20.000	1.083	23.000	20.000	1.083	20.000	1.083	23.000	20.000	23.000
20.000	1.087	24.000	20.000	1.087	20.000	1.087	24.000	20.000	24.000
20.000	1.091	25.000	20.000	1.091	20.000	1.091	25.000	20.000	25.000
20.000	1.095	26.000	20.000	1.095	20.000	1.095	26.000	20.000	26.000
20.000	1.099	27.000	20.000	1.099	20.000	1.099	27.000	20.000	27.000
20.000	1.103	28.000	20.000	1.103	20.000	1.103	28.000	20.000	28.000
20.000	1.107	29.000	20.000	1.107	20.000	1.107	29.000	20.000	29.000
20.000	1.111	30.000	20.000	1.111	20.000	1.111	30.000	20.000	30.000
20.000	1.115	31.000	20.000	1.115	20.000	1.115	31.000	20.000	31.000
20.000	1.119	32.000	20.000	1.119	20.000	1.119	32.000	20.000	32.000
20.000	1.123	33.000	20.000	1.123	20.000	1.123	33.000	20.000	33.000
20.000	1.127	34.000	20.000	1.127	20.000	1.127	34.000	20.000	34.000
20.000	1.131	35.000	20.000	1.131	20.000	1.131	35.000	20.000	35.000
20.000	1.135	36.000	20.000	1.135	20.000	1.135	36.000	20.000	36.000
20.000	1.139	37.000	20.000	1.139	20.000	1.139	37.000	20.000	37.000
20.000	1.143	38.000	20.000	1.143	20.000	1.143	38.000	20.000	38.000
20.000	1.147	39.000	20.000	1.147	20.000	1.147	39.000	20.000	39.000
20.000	1.151	40.000	20.000	1.151	20.000	1.151	40.000	20.000	40.000
20.000	1.155	41.000	20.000	1.155	20.000	1.155	41.000	20.000	41.000
20.000	1.159	42.000	20.000	1.159	20.000	1.159	42.000	20.000	42.000
20.000	1.163	43.000	20.000	1.163	20.000	1.163	43.000	20.000	43.000
20.000	1.167	44.000	20.000	1.167	20.000	1.167	44.000	20.000	44.000
20.000	1.171	45.000	20.000	1.171	20.000	1.171	45.000	20.000	45.000
20.000	1.175	46.000	20.000	1.175	20.000	1.175	46.000	20.000	46.000
20.000	1.179	47.000	20.000	1.179	20.000	1.179	47.000	20.000	47.000
20.000	1.183	48.000	20.000	1.183	20.000	1.183	48.000	20.000	48.000
20.000	1.187	49.000	20.000	1.187	20.000	1.187	49.000	20.000	49.000
20.000	1.191	50.000	20.000	1.191	20.000	1.191	50.000	20.000	50.000
20.000	1.195	51.000	20.000	1.195	20.000	1.195	51.000	20.000	51.000
20.000	1.199	52.000	20.000	1.199	20.000	1.199	52.000	20.000	52.000
20.000	1.203	53.000	20.000	1.203	20.000	1.203	53.000	20.000	53.000
20.000	1.207	54.000	20.000	1.207	20.000	1.207	54.000	20.000	54.000
20.000	1.211	55.000	20.000	1.211	20.000	1.211	55.000	20.000	55.000
20.000	1.215	56.000	20.000	1.215	20.000	1.215	56.000	20.000	56.000
20.000	1.219	57.000	20.000	1.219	20.000	1.219	57.000	20.000	57.000
20.000	1.223	58.000	20.000	1.223	20.000	1.223	58.000	20.000	58.000
20.000	1.227	59.000	20.000	1.227	20.000	1.227	59.000	20.000	59.000
20.000	1.231	60.000	20.000	1.231	20.000	1.231	60.000	20.000	60.000
20.000	1.235	61.000	20.000	1.235	20.000	1.235	61.000	20.000	61.000
20.000	1.239	62.000	20.000	1.239	20.000	1.239	62.000	20.000	62.000
20.000	1.243	63.000	20.000	1.243	20.000	1.243	63.000	20.000	63.000
20.000	1.247	64.000	20.000	1.247	20.000	1.247	64.000	20.000	64.000
20.000	1.251	65.000	20.000	1.251	20.000	1.251	65.000	20.000	65.000
20.000	1.255	66.000	20.000	1.255	20.000	1.255	66.000	20.000	66.000
20.000	1.259	67.000	20.000	1.259	20.000	1.259	67.000	20.000	67.000
20.000	1.263	68.000	20.000	1.263	20.000	1.263	68.000	20.000	68.000
20.000	1.267	69.000	20.000	1.267	20.000	1.267	69.000	20.000	69.000
20.000	1.271	70.000	20.000	1.271	20.000	1.271	70.000	20.000	70.000
20.000	1.275	71.000	20.000	1.275	20.000	1.275	71.000	20.000	71.000
20.000	1.279	72.000	20.000	1.279	20.000	1.279	72.000	20.000	72.000
20.000	1.283	73.000	20.000	1.283	20.000	1.283	73.000	20.000	73.000
20.000	1.287	74.000	20.000	1.287	20.000	1.287	74.000	20.000	74.000
20.000	1.291	75.000	20.000	1.291	20.000	1.291	75.000	20.000	75.000
20.000	1.295	76.000	20.000	1.295	20.000	1.295	76.000	20.000	76.000
20.000	1.299	77.000	20.000	1.299	20.000	1.299	77.000	20.000	77.000
20.000	1.303	78.000	20.000	1.303	20.000	1.303	78.000	20.000	78.000
20.000	1.307	79.000	20.000	1.307	20.000	1.307	79.000	20.000	79.000
20.000	1.311	80.000	20.000	1.311	20.000	1.311	80.000	20.000	80.000
20.000	1.315	81.000	20.000	1.315	20.000	1.315	81.000	20.000	81.000
20.000	1.319	82.000	20.000	1.319	20.000	1.319	82.000	20.000	82.000
20.000	1.323	83.000	20.000	1.323	20.000	1.323	83.000	20.000	83.000
20.000	1.327	84.000	20.000	1.327	20.000	1.327	84.000	20.000	84.000
20.000	1.331	85.000	20.000	1.331	20.000	1.331	85.000	20.000	85.000
20.000	1.335	86.000	20.000	1.335	20.000	1.335	86.000	20.000	86.000
20.000	1.339	87.000	20.000	1.339	20.000	1.339	87.000	20.000	87.000
20.000	1.343	88.000	20.000	1.343	20.000	1.343	88.000	20.000	88.000
20.000	1.347	89.000	20.000	1.347	20.000	1.347	89.000	20.000	89.000
20.000	1.351	90.000	20.000	1.351	20.000	1.351	90.000	20.000	90.000
20.000	1.355	91.000	20.000	1.355	20.000	1.355	91.000	20.000	91.000
20.000	1.359	92.000	20.000	1.359	20.000	1.359	92.000	20.000	92.000
20.000	1.363	93.000	20.000	1.363	20.000	1.363	93.000	20.000	93.000
20.000	1.367	94.000	20.000	1.367	20.000	1.367	94.000	20.000	94.000
20.000	1.371	95.000	20.000	1.371	20.000	1.371	95.000	20.000	95.000
20.000	1.375	96.000	20.000	1.375	20.000	1.375	96.000	20.000	96.000
20.000	1.379	97.000	20.000	1.379	20.000	1.379	97.000	20.000	97.000
20.000	1.383	98.000	20.000	1.383	20.000	1.383	98.000	20.000	98.000
20.000	1.387	99.000	20.000	1.387	20.000	1.387	99.000	20.000	99.000
20.000	1.391	100.000	20.000	1.391	20.000	1.391	100.000	20.000	100.000

-9.612	1.445	13.00	-7.015	1.445	13.00	0.625	1.445	40.00
-10.357	1.449	14.00	-10.357	1.449	14.00	0.122	1.449	41.00
-6.487	1.459	15.00	-6.487	1.459	15.00	1.116	1.459	42.00
-7.501	1.465	16.00	-7.500	1.465	16.00	0.695	1.465	43.00
20.001	1.537	1.00	-5.022	1.537	17.00	20.000	1.537	1.00
30.001	1.540	2.00	-5.335	1.540	18.00	30.000	1.540	2.00
30.001	1.565	3.00	-4.737	1.565	19.00	10.000	1.565	3.00
5.000	1.596	4.00	-5.000	1.596	20.00	5.000	1.596	4.00
11.000	1.602	5.00	-3.095	1.602	21.00	11.000	1.602	5.00
7.001	1.606	6.00	-5.409	1.606	22.00	7.500	1.606	6.00
11.429	1.612	7.00	-1.739	1.612	23.00	11.429	1.612	7.00
5.001	1.616	8.00	-5.333	1.616	24.00	5.000	1.616	8.00
6.111	1.625	9.00	-2.600	1.625	25.00	6.111	1.625	9.00
7.001	1.631	10.00	-1.923	1.631	26.00	7.000	1.631	10.00
6.364	1.636	11.00	-1.652	1.636	27.00	6.364	1.636	11.00
7.003	1.653	12.00	-1.250	1.653	28.00	7.003	1.653	12.00
6.447	1.659	13.00	-1.172	1.659	29.00	6.446	1.659	13.00
6.214	1.665	14.00	-1.167	1.665	30.00	6.214	1.665	14.00
5.001	1.680	1.00	-5.000	1.680	1.00	7.333	1.680	15.00
7.501	1.684	2.00	7.500	1.684	2.00	6.122	1.684	16.00
-10.001	1.690	3.00	-10.000	1.690	3.00	5.000	1.690	17.00
-7.501	1.700	4.00	-7.500	1.700	4.00	4.722	1.700	18.00
-15.001	1.704	5.00	-15.000	1.704	5.00	2.102	1.704	19.00
-17.501	1.712	6.00	-17.500	1.712	6.00	0.500	1.712	20.00
-10.714	1.717	7.00	-11.714	1.717	7.00	1.902	1.717	21.00
-13.125	1.722	8.00	-13.125	1.722	8.00	0.457	1.722	22.00
-6.844	1.726	9.00	-6.844	1.726	9.00	1.522	1.726	23.00
-6.000	1.734	10.00	-6.000	1.734	10.00	2.292	1.734	24.00
-3.630	1.741	11.00	-3.630	1.741	11.00	3.000	1.741	25.00
-6.467	1.747	12.00	-6.467	1.747	12.00	1.346	1.747	26.00
-6.534	1.761	13.00	-6.534	1.761	13.00	1.111	1.761	27.00
-5.000	1.768	14.00	-5.000	1.768	14.00	1.607	1.768	28.00
-4.467	1.773	15.00	-4.467	1.773	15.00	1.522	1.773	29.00
-2.500	1.792	16.00	-2.500	1.792	16.00	2.500	1.792	30.00
-4.707	1.800	17.00	-4.706	1.800	17.00	1.129	1.800	31.00
-7.222	1.806	18.00	-7.222	1.806	18.00	-0.469	1.806	32.00
10.001	1.836	1.00	-6.316	1.836	19.00	-0.152	1.836	33.00
-15.001	1.866	2.00	-6.000	1.866	20.00	-1.324	1.866	34.00
0.001	1.875	3.00	-6.190	1.875	21.00	-0.429	1.875	35.00
0.001	1.884	4.00	-5.909	1.884	22.00	-0.417	1.884	36.00
-5.000	1.892	5.00	-7.609	1.892	23.00	-1.622	1.892	37.00
-12.500	1.906	6.00	-4.542	1.906	24.00	-2.364	1.906	38.00
-7.457	1.916	7.00	-7.460	1.916	25.00	-1.795	1.916	39.00
-3.750	1.923	8.00	-6.154	1.923	26.00	-1.125	1.923	40.00
-6.467	1.930	9.00	-7.037	1.930	27.00	-1.429	1.930	41.00
-3.500	1.936	10.00	-5.893	1.936	28.00	-1.190	1.936	42.00
-4.093	1.942	11.00	-6.034	1.942	29.00	-1.395	1.942	43.00
-4.563	1.947	12.00	-6.167	1.947	30.00	-1.591	1.947	44.00
-7.707	1.964	13.00	-7.258	1.964	31.00	-2.444	1.964	45.00
-6.780	1.970	14.00	-7.031	1.970	32.00	-2.391	1.970	46.00
-6.467	1.976	15.00	-7.879	1.976	33.00	-3.085	1.976	47.00
-6.125	1.980	16.00	-7.647	1.980	34.00	-3.021	1.980	48.00
-7.447	1.986	17.00	-7.429	1.986	35.00	-2.959	1.986	49.00

-21.00	2.693	-0.739	3.00	2.693	-21.000	3.00	15.00	2.693	15.00
-24.25	2.703	-11.319	4.00	2.703	-24.250	4.00	16.00	2.703	16.00
-27.50	2.710	-11.647	5.00	2.710	-27.500	5.00	17.00	2.710	17.00
-30.75	2.721	-11.056	6.00	2.721	-30.750	6.00	18.00	2.721	18.00
-34.00	2.743	-9.526	7.00	2.743	-34.000	7.00	19.00	2.743	19.00
-37.25	2.755	-7.951	8.00	2.755	-37.250	8.00	20.00	2.755	20.00
-40.50	2.760	-6.333	9.00	2.760	-40.500	9.00	21.00	2.760	21.00
-43.75	2.810	-4.655	10.00	2.810	-43.750	10.00	22.00	2.810	22.00
-47.00	2.814	-3.014	11.00	2.814	-47.000	11.00	23.00	2.814	23.00
-50.25	2.818	-1.355	12.00	2.818	-50.250	12.00	24.00	2.818	24.00
-53.50	2.822	-0.041	13.00	2.822	-53.500	13.00	25.00	2.822	25.00
-56.75	2.826	-11.142	14.00	2.826	-56.750	14.00	26.00	2.826	26.00
-60.00	2.830	-12.554	15.00	2.830	-60.000	15.00	27.00	2.830	27.00
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-63.25	2.834	-11.424	16.00	2.834	-63.250	16.00	28.00	2.834	28.00
-66.50	2.837	-12.724	17.00	2.837	-66.500	17.00	29.00	2.837	29.00
-69.75	2.842	-12.457	18.00	2.842	-69.750	18.00	30.00	2.842	30.00
-73.00	2.847	-11.353	19.00	2.847	-73.000	19.00	31.00	2.847	31.00
-76.25	2.851	-11.250	20.00	2.851	-76.250	20.00	32.00	2.851	32.00
-79.50	2.856	-12.097	21.00	2.856	-79.500	21.00	33.00	2.856	33.00
-82.75	2.860	-11.733	22.00	2.860	-82.750	22.00	34.00	2.860	34.00
-86.00	2.865	-12.114	23.00	2.865	-86.000	23.00	35.00	2.865	35.00
-89.25	2.870	-12.472	24.00	2.870	-89.250	24.00	36.00	2.870	36.00
-92.50	2.874	-12.541	25.00	2.874	-92.500	25.00	37.00	2.874	37.00
-95.75	2.878	-13.283	26.00	2.878	-95.750	26.00	38.00	2.878	38.00
-100.00	2.884	-13.584	27.00	2.884	-100.000	27.00	39.00	2.884	39.00
-103.25	2.889	-13.100	28.00	2.889	-103.250	28.00	40.00	2.889	40.00
-106.50	2.895	-13.234	29.00	2.895	-106.500	29.00	41.00	2.895	41.00
-109.75	2.901	-12.084	30.00	2.901	-109.750	30.00	42.00	2.901	42.00
-113.00	2.907	-12.541	31.00	2.907	-113.000	31.00	43.00	2.907	43.00
-116.25	2.912	-11.422	32.00	2.912	-116.250	32.00	44.00	2.912	44.00
-119.50	2.918	-13.340	33.00	2.918	-119.500	33.00	45.00	2.918	45.00
-122.75	2.923	-12.639	34.00	2.923	-122.750	34.00	46.00	2.923	46.00
-126.00	2.928	-11.950	35.00	2.928	-126.000	35.00	47.00	2.928	47.00
-129.25	2.933	-11.214	36.00	2.933	-129.250	36.00	48.00	2.933	48.00
-132.50	2.938	-12.281	37.00	2.938	-132.500	37.00	49.00	2.938	49.00
-135.75	2.943	-12.281	38.00	2.943	-135.750	38.00	50.00	2.943	50.00
-139.00	2.948	-11.549	39.00	2.948	-139.000	39.00	51.00	2.948	51.00
-142.25	2.954	-10.446	40.00	2.954	-142.250	40.00	52.00	2.954	52.00
-145.50	2.959	-11.430	41.00	2.959	-145.500	41.00	53.00	2.959	53.00
-148.75	2.965	-11.000	42.00	2.965	-148.750	42.00	54.00	2.965	54.00
-152.00	2.970	-11.184	43.00	2.970	-152.000	43.00	55.00	2.970	55.00
-155.25	2.976	-10.444	44.00	2.976	-155.250	44.00	56.00	2.976	56.00
-158.50	2.981	-10.614	45.00	2.981	-158.500	45.00	57.00	2.981	57.00
-161.75	2.987	-10.580	46.00	2.987	-161.750	46.00	58.00	2.987	58.00
-165.00	2.992	-11.117	47.00	2.992	-165.000	47.00	59.00	2.992	59.00
-168.25	2.998	-11.583	48.00	2.998	-168.250	48.00	60.00	2.998	60.00
-171.50	3.003	-11.475	49.00	3.003	-171.500	49.00	61.00	3.003	61.00
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-174.75	3.009	-9.500	50.00	3.009	-174.750	50.00	62.00	3.009	62.00
-178.00	3.015	-22.500	51.00	3.015	-178.000	51.00	63.00	3.015	63.00
-181.25	3.022	-25.553	52.00	3.022	-181.250	52.00	64.00	3.022	64.00
-184.50	3.028	-15.250	53.00	3.028	-184.500	53.00	65.00	3.028	65.00
-187.75	3.035	-14.500	54.00	3.035	-187.750	54.00	66.00	3.035	66.00
-191.00	3.042	-14.500	55.00	3.042	-191.000	55.00	67.00	3.042	67.00
-194.25	3.049	-14.500	56.00	3.049	-194.250	56.00	68.00	3.049	68.00
-197.50	3.056	-14.500	57.00	3.056	-197.500	57.00	69.00	3.056	69.00
-200.75	3.063	-14.500	58.00	3.063	-200.750	58.00	70.00	3.063	70.00
-204.00	3.070	-14.500	59.00	3.070	-204.000	59.00	71.00	3.070	71.00
-207.25	3.077	-14.500	60.00	3.077	-207.250	60.00	72.00	3.077	72.00
-210.50	3.084	-14.500	61.00	3.084	-210.500	61.00	73.00	3.084	73.00
-213.75	3.091	-14.500	62.00	3.091	-213.750	62.00	74.00	3.091	74.00
-217.00	3.098	-14.500	63.00	3.098	-217.000	63.00	75.00	3.098	75.00
-220.25	3.105	-14.500	64.00	3.105	-220.250	64.00	76.00	3.105	76.00
-223.50	3.112	-14.500	65.00	3.112	-223.500	65.00	77.00	3.112	77.00
-226.75	3.119	-14.500	66.00	3.119	-226.750	66.00	78.00	3.119	78.00
-230.00	3.126	-14.500	67.00	3.126	-230.000	67.00	79.00	3.126	79.00
-233.25	3.133	-14.500	68.00	3.133	-233.250	68.00	80.00	3.133	80.00
-236.50	3.140	-14.500	69.00	3.140	-236.500	69.00	81.00	3.140	81.00
-239.75	3.147	-14.500	70.00	3.147	-239.750	70.00	82.00	3.147	82.00
-243.00	3.154	-14.500	71.00	3.154	-243.000	71.00	83.00	3.154	83.00
-246.25	3.161	-14.500	72.00	3.161	-246.250	72.00	84.00	3.161	84.00
-249.50	3.168	-14.500	73.00	3.168	-249.500	73.00	85.00	3.168	85.00
-252.75	3.175	-14.500	74.00	3.175	-252.750	74.00	86.00	3.175	86.00
-256.00	3.182	-14.500	75.00	3.182	-256.000	75.00	87.00	3.182	87.00
-259.25	3.189	-14.500	76.00	3.189	-259.250	76.00	88.00	3.189	88.00
-262.50	3.196	-14.500	77.00	3.196	-262.500	77.00	89.00	3.196	89.00
-265.75	3.203	-14.500	78.00	3.203	-265.750	78.00	90.00	3.203	90.00
-269.00	3.210	-14.500	79.00	3.210	-269.000	79.00	91.00	3.210	91.00
-272.25	3.217	-14.500	80.00	3.217	-272.250	80.00	92.00	3.217	92.00
-275.50	3.224	-14.500	81.00	3.224	-275.500	81.00	93.00	3.224	93.00
-278.75	3.231	-14.500	82.00	3.231	-278.750	82.00	94.00	3.231	94.00
-282.00	3.238	-14.500	83.00	3.238	-282.000	83.00	95.00	3.238	95.00
-285.25	3.245	-14.500	84.00	3.245	-285.250	84.00	96.00	3.245	96.00
-288.50	3.252	-14.500	85.00	3.252	-288.500	85.00	97.00	3.252	97.00
-291.75	3.259	-14.500	86.00	3.259	-291.750	86.00	98.00	3.259	98.00
-295.00	3.266	-14.500	87.00	3.266	-295.000	87.00	99.00	3.266	99.00
-298.25	3.273	-14.500	88.00	3.273	-298.250	88.00	100.00	3.273	100.00
-301.50	3.280	-14.500	89.00	3.280	-301.500	89.00			
-304.75	3.287	-14.500	90.00	3.287	-304.750	90.00			
-308.00	3.294	-14.500	91.00	3.294	-308.000	91.00			
-311.25	3.301	-14.500	92.00	3.301	-311.250	92.00			
-314.50	3.308	-14.500	93.00	3.308	-314.500	93.00			
-317.75	3.315	-14.500	94.00	3.315	-317.750	94.00			
-321.00	3.322	-14.500	95.00	3.322	-321.000	95.00			
-324.25	3.329	-14.500	96.00	3.329	-324.250	96.00			
-327.50	3.336	-14.500	97.00	3.336	-327.500	97.00			
-330.75	3.343	-14.500	98.00	3.343	-330.750	98.00			
-334.00	3.350	-14.500	99.00	3.350	-334.000	99.00			
-337.25	3.357	-14.500	100.00	3.357	-337.250	100.00			

-19.714	3.154	7.00	-1.744	3.134	7.00	-19.744	3.134	7.00
-23.500	3.152	8.00	-23.500	3.152	8.00	-23.500	3.152	8.00
-20.000	3.150	9.00	-20.000	3.150	9.00	-20.000	3.150	9.00
-10.000	3.102	10.00	-10.000	3.102	10.00	-10.000	3.102	10.00
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-20.000	3.108	1.00	-10.000	3.108	11.00	-10.000	3.108	11.00
-32.500	3.173	2.00	-21.000	3.173	12.00	-21.000	3.173	12.00
-16.500	3.170	3.00	-17.500	3.170	13.00	-17.500	3.170	13.00
-3.750	3.191	4.00	-14.500	3.191	14.00	-14.500	3.191	14.00
-5.000	3.212	5.00	-16.000	3.212	15.00	-16.000	3.212	15.00
-10.000	3.233	6.00	-15.000	3.233	16.00	-15.000	3.233	16.00
-10.000	3.267	7.00	-13.000	3.267	17.00	-13.000	3.267	17.00
-1.250	3.280	8.00	-11.000	3.280	18.00	-11.000	3.280	18.00
-5.000	3.285	9.00	-13.000	3.285	19.00	-13.000	3.285	19.00
-7.000	3.292	10.00	-12.000	3.292	20.00	-12.000	3.292	20.00
-10.000	3.296	11.00	-14.000	3.296	21.00	-14.000	3.296	21.00
-11.000	3.303	12.00	-14.000	3.303	22.00	-14.000	3.303	22.00
-12.000	3.315	13.00	-15.000	3.315	23.00	-15.000	3.315	23.00
.....
0.000	3.327	1.00	0.000	3.327	1.00	-14.700	3.327	24.00
0.000	3.361	2.00	0.000	3.361	2.00	-14.120	3.361	25.00
15.000	3.367	3.00	15.000	3.367	3.00	-11.800	3.367	26.00
0.000	3.373	4.00	0.000	3.373	4.00	-13.074	3.373	27.00
0.000	3.381	5.00	0.000	3.381	5.00	-11.000	3.381	28.00
0.000	3.400	6.00	-0.000	3.400	6.00	-12.500	3.400	29.00
-7.000	3.416	7.00	-7.100	3.416	7.00	-13.400	3.416	30.00
-6.250	3.422	8.00	-0.250	3.422	8.00	-15.000	3.422	31.00
-11.111	3.420	9.00	-12.111	3.420	9.00	-14.100	3.420	32.00
-7.000	3.432	10.00	-7.500	3.432	10.00	-12.900	3.432	33.00
-5.000	3.452	11.00	-5.000	3.452	11.00	-12.147	3.452	34.00
-8.750	3.459	12.00	-8.750	3.459	12.00	-13.000	3.459	35.00
-6.500	3.466	13.00	-6.500	3.466	13.00	-12.167	3.466	36.00
-8.571	3.476	14.00	-8.571	3.476	14.00	-12.700	3.476	37.00
-9.000	3.483	15.00	-9.000	3.483	15.00	-13.100	3.483	38.00
-11.500	3.491	16.00	-11.500	3.491	16.00	-13.700	3.491	39.00
-13.000	3.498	17.00	-13.000	3.498	17.00	-14.400	3.498	40.00
.....
-20.000	3.533	1.00	-15.278	3.533	18.00	-20.000	3.533	1.00
-45.000	3.574	2.00	-16.579	3.574	19.00	-45.000	3.574	2.00
-35.330	3.620	3.00	-16.250	3.620	20.00	-35.330	3.620	3.00
-22.000	3.638	4.00	-15.000	3.638	21.00	-22.000	3.638	4.00
.....
-20.000	3.609	1.00	-20.000	3.609	1.00	-28.000	3.609	5.00
-45.000	3.685	2.00	-45.000	3.685	2.00	-30.000	3.685	6.00
-45.000	3.702	3.00	-45.000	3.702	3.00	-32.143	3.702	7.00
-43.750	3.711	4.00	-43.750	3.711	4.00	-33.125	3.711	8.00
-40.000	3.721	5.00	-40.000	3.721	5.00	-32.222	3.721	9.00
-41.000	3.735	6.00	-41.000	3.735	6.00	-34.000	3.735	10.00
-40.000	3.740	7.00	-40.000	3.740	7.00	-33.000	3.740	11.00
-35.750	3.748	8.00	-35.750	3.748	8.00	-33.333	3.748	12.00
-35.000	3.755	9.00	-35.000	3.755	9.00	-32.300	3.755	13.00
.....
0.000	3.805	1.00	-32.500	3.805	10.00	-29.000	3.805	14.00
0.000	3.900	2.00	-20.000	3.900	11.00	-27.500	3.900	15.00
1.000	3.904	3.00	-27.000	3.904	12.00	-25.000	3.904	16.00
7.500	3.917	4.00	-23.000	3.917	13.00	-22.000	3.917	17.00

